

# Aviation Week & Space Technology

June 3, 1963

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Saab 105 Twin-Jet Trainer

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Higher and higher recording speeds mean instrumentation progress—and problems. Increased speed and tension on tape generates friction that concentrates heat around recording heads and can make ordinary tape unreliable. Signal dropout or distortion can result when this localized, high-temperature build-up separates recording oxides from tape backing.



**THEORETICAL JACK** Bulletin No. 3 explains temperature effects on recording tape, discusses heavy duty oxide and binder combinations. Proc. Just write 3M Magnetic Products Division, Dept. MCI-03, St. Paul 19, Minn.

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Magnetic Products Division 

Institute of Chemical Engineers, Institute of Electrical and Electronic Engineers, American Society of Mechanical Engineers, Instrument Society of America.

**June 18-19th Annual Meeting, American Society for Testing and Materials, Chelmsford-Hendon Hall, London, Eng.**

**June 26-27—10th Annual Symposium on Computers and Data Processing, University of Toronto, Ontario, Canada. Inquiries: 416/978-2828.**

June 26-27—Symposium on Dynamic Load  
Buildings, 14, University of Minnesota

Stable Hilton Hotel, Buffalo, N. Y. Spun  
out. Cornell Architectural Laboratory,  
Ithaca, New York.

June 25-July 5—Second Annual Double Fly-In Double Beach Hotel, Double F.R.

John T. Hill—Deputy National Coordinator on Aerospace Education, National Aerospace Education Council, 1101st Dismville, Mo

July 9-11—International Symposium on Space  
Telecommunications, Institute of Elec.

ness and Electronic Engineers Professional Group on Antennas and Propagation, Boulder Laboratories, Boulder, Colo.

**Jul. 10/12—Meteorological Support for Aerospace Testing and Operations.** American Institute of Aeronautics and Astronautics

Feb. 21/22nd Curran's Presidential Conference

(Confidential), American Institute of  
 Accoustics and Astronautics U. S. Naval  
 Underwater Influence Laboratory, New

July 21-27-1961 Micromaturation Course  
c/o American Institute for Microscopy

1. 10 Ave. 4th Fl. Grand St. Co.

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Lab. 49—International Conventions and its  
Effect on Aerospace Support, Institute of  
Electrical and Electronic Engineers/  
Aerospace Division, Melbourne, Aust.

Chemical Society of Washington and  
1001 Park Shelden Hotel, Washington  
Aug. 19-21, 1961 Annual National Meeting

Sam. Smith, of Photographs International  
tation Engineers, Ambassador Hotel, Los  
Angeles, Calif.

Aug. 12-14—Guidance and Control Conference, American Institute of Aeronautics and Astronautics, Massachusetts Institute of Technology.

Aug. 14-16—Fifth Biennial Can Dynamics Symposium, Northern Arizona University

Aug. 1921 — Astrochemical Conference.

Ugandan Institute of Aeronautics and Astronautics, Ede University, New Haven, Aug. 1972-1981. Courses: Engineering

Coauthors: Boulder, Colo. Spemann,  
University of Colorado, 3000 Campus  
Engineering Laboratory

Aug. 28/29—1991 Western Electronic Show and Convention (WESCON) Convention Center, San Francisco, Calif.

(Continued on page 9)

Type RM581A Oscilloscope—with Type 341 Dual-Trace Amplifier Unit and Type 345 Time Base Unit—provides high sensitivity, wide-band, dual-trace operation combined with calibrated sweep delay in a compact, moderately priced package.

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TYPE RUBEN A OSCILLOSCOPE (without plug lead)	95
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Fig. 1. The dependence of the rate of the reaction of the formation of the product on the concentration of the reactants. The reaction of the formation of the product is the reaction of the formation of the product.

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The rocket-powered Northrop RP-78 target drone puts on a good act. It can simulate almost any type of enemy bomber on a radar screen. It flies at Mach 1.3, and operates at 68,000 feet. Performs evasive action by remote control throughout its entire flight. Attracts all operational missiles, including heat-seeking types. Inexpensive to recover and re-

lent is an essential. It can be shot down if desired. The RP-78 is currently in use at the McGregor Range where United States Army and NATO air defense missile crews are being trained. It is also in use at the X-ray missile range at Point Mugu for air-to-air and surface-to-air proficiency missile tests. **NORTHROP VENTURA**

## AEROSPACE CALENDAR

(Continued from page 7)

Conference, American Institute of Aeronautics and Astronautics, Dallas-Ft. Worth, Texas, Oct. 11-12

Aug. 26-28—Conference on Physics of Entry into Planetary Atmospheres, American Institute of Aeronautics and Astronautics, Massachusetts Institute of Technology, Cambridge, Mass.

Sept. 8-11—International Symposium on High Temperature Technology, Ankara, USSR. Sponsor: Stanford Research Inst., Calif.

Sept. 6-11—Annual Meeting, Air Industries Association of Canada, Montreal, Quebec, Montreal, Quebec.

Sept. 9-11—Seventh National Convention on Military Electronics, Institute of Electrical and Electronics Engineers, Sheraton Hotel, Washington, D.C.

Sept. 8-12-15th Annual International Automation Conference & Exhibit, American Society of Automation, McCormick Place, Chicago, Ill.

Sept. 19-21—National Symposium on Space Electronics, Science and Technology, Edmonds AFB, Calif. Sponsor: American Astronautical Society, Air Force Flight Test Center.

Sept. 30-31—International Aviation Research and Development Symposium, Atlantic City, N.J. Sponsor: Federal Aviation Agency.

Sept. 19-22—1965 Aircraft Operations and Maintenance Symposium, Atlantic City, N.J. Sept. 23-27—International Technology Conference, New York, London, Reg.

Sept. 23-27—International Technology Conference, New York, London, Reg. Sponsor: Institute of Electrical Engineers (London), American Institute of Aeronautics and Astronautics, Institute of Electrical and Electronics Engineers, Institution of Engineers.

Sept. 29-30—Second Annual Symposium on the Physics of Fluids in Electronics, Chicago, Ill. Sponsor: Rome Air Development Center, Vinton Research Facility, Tenn.

Sept. 28-Oct. 1-1965 Congress, International Astronautical Federation, Paris.

Sept. 28-Oct. 2—National Interdisciplinary Examination Meeting, American Institute of Aeronautics and Astronautics, Colgate Motor Hotel, Palo Alto, Calif.

Sept. 30-Oct. 1—Canadian Electronics Conference, Institute of Electrical and Electronics Engineers, Exhibition Park, Toronto, Canada.

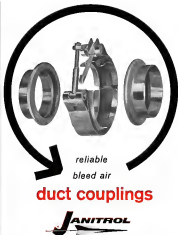
Oct. 1-3—Eighteenth National Symposium on Space Electronics, Institute of Electrical and Electronics Engineers, Fort Belvoir, Fort Belvoir, Mo.

Oct. 2-4—National Area of the Traffic Sciences, Sheraton Oklahoma Hotel, Oklahoma City, Okla.

Oct. 28-30—Ninth National Communications Symposium, Institute of Electrical and Electronics Engineers, Hotel Otis, Otis, N.Y.

Oct. 19-20—Eighteenth Annual Symposium and Symposium, Air Traffic Control Association, Hilton Hotel, Dallas, Tex.

Oct. 23-24—Eighteenth Symposium on Ballistic Missile and Space Technology, Naval Training Center, San Diego, Calif. Sponsor: Air Force Space Systems Div., Air Force Ballistic Systems Div., Aerospace Corp.



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# So when I got back from lunch Jake was still up to his eyeballs in strip charts. They were spilling from the table onto the floor, and there was a big pile in the corner that he hadn't even touched. There was this wild gleam in his eye.

"Found out yet why Test Op Twenty-seven went ker-boom?" I asked innocently.

"Don't be a wise guy," Jake started. "I just got word from the Chief Engineer that he has to have some preliminary answers by five o'clock tomorrow. He's got to be in here trying to line up forty-three thousand or eight strip charts that were recorded at four different spots."

"All it takes is a little patience," I reminded him. "You told me so yourself."

"All right, smart apple," he growled, "maybe I wish I'd recorded with one of those time code rigs like you said, but it's too late now. Don't just stand there, see if you can help me assemble this mess."

"I'll do better than that," I said, "I'll give you your birthday present early this year." I pulled a reel of mag tape out from behind my back and showed it to him.

"That's that?" Jake was looking at it. "It might have been. I have to admit I played a dirty trick on you," I said. "I borrowed a time code generator from Dr. Adams over at Anderson's lab and patched it into the extra recorder along with the telemetry signal from the firing stand. The whole sequence is right here, I told you BFG Formosa B."

"Jake's mouth was doing a beautiful imitation of a dying monkey."

"I also borrowed a tape switch and control system," I continued. "Step over so my test card and see how the big boys do it."

I threaded the tape into the transport and released the disengagement for the channels we were most interested in. "Do me a favor yet when the show's done?" I asked Jake as I turned on the power.

"About T-zero plus eight," he told me weakly, "and I hope you're not wasting my time. In fact his minutes the Chief

Engineer is going to walk in here roaring like a million pound boxer."

"He'll be ready for him," I said. "I accumulated T-zero plus eight into a clock time. I preset the generator start time to ten seconds before the engine had exploded and the stop time at five seconds after. You do it with digital switches, and it's easier than playing Yahtzee. Double on the place with one three."

I set the T S and C to "Automatic" and pressed the "zero search start" button. The transport crept up to search speed and the VHS tape time display lit up showing days, hours, minutes and seconds. In a few moments the transport had reached the preset start time and evened. It automatically reversed until it was positioned in advance of the starting spot on the tape. Then the search and control system's "drive playback" indicator light came on and issues started appearing on the oscilloscope paper.

"What's that pocket force on Channel 1?" Jake asked, trying to suppressively.

"That's the time code," I told him. "No more counting hours, days or pulses to correlate events. You can read days, hours, minutes, and seconds directly from the pattern of pulse widths in any segment of the recording."

"Why can't?"

"You'll learn. It's easy."

Before the system had even reached the preset stop time, we were starting to get something.

"Look," I said, "Channel 16 shows that flame was established at 10:41:19, but Channel 14 says the main fuel control valve still hadn't opened all the way at 10:41:22. Now look at Channel 20. By 10:41:24 pump pressure had gone off scale. Then it drops to zero."

"That must mean the fuel line ruptured. Fuel would have started going into the combustion chamber," Jake observed.

"Yes, and the blow at just past 10:41:26, that's where all the on-board standpipes go down. Now will you sign these reports out for a time code generator and an automatic tape search and control of our own?"

"What a mess," Jake said. "Let's see if we can tell why the main fuel valve didn't open all the way." Some people are never satisfied.

We went back to spot the five-second sequence of events at the test playback scene we were using, so I showed him another juicy trick. I set the system to read the time code on the short circuit interval just when the valve had failed to open. Then the answer became obvious. The combustion chamber pressure switch should have closed before the valve sequence began. The failure was caused on the switch.

"So now you're ready for the Chief," I said, rubbing it in, "and you still have thirty seconds to spare."

He didn't know whether to sit or not sit, so he did both. I forgot to mention that the pretty card for a test engineer, in fact, I'm the only female in the department. Nobody goes to show that not even a woman's needs to rely on a machine, much less on counting pulses, when there's a time code system's handy.



• **Model 810**—The first of the new series, it's a compact, portable unit that can be used in the field or in the lab. It's a true time code generator, with a built-in clock and a built-in timer. It's a true time code generator, with a built-in clock and a built-in timer. It's a true time code generator, with a built-in clock and a built-in timer.

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## More Space Debate

The current debate over the size, scope and purpose of the U.S. national space program should eventually contribute greatly to better public understanding of how we are exploring space and why. No doubt it will cause serious arguments in some National Academies and Space Administration officials whose pet programs and plans may be belied rather vigorously. But in the long run this debate will serve a very useful purpose.

Since President Kennedy's original decision to put this nation into a high-priority space exploration program, with a measured house landing as its major focal point, there has been too much of a tendency to view this program as simply a make-up dash to the moon, with serial rights to the lunar cliffhanger being auctioned to the highest bidder. Unfortunately, the original mistake of having an astronaut's selection automatically equipped with a bag of serial rights gold may be perpetuated by NASA if current plans to authorize a multi-million dollar public exploitation package for the new astronauts are not quickly squelched. This "show bar" type of astronaut promotion certainly provides an unnecessary *Archie* feel on which critics of the space program can score at will. If the astronauts have a pay problem, it should be settled within the framework of how similar high-risk jobs are handled in the military and government service, and not by holding a commercial auction for their personality value at a multi-million dollar "package deal."

## Educational Value

The current debate has done much to explain to the public what Congress the real aims of the space program, which are the development of a broad capabilities in space technology that eventually can be applied to whatever national purpose is needed that may arise in the future. Gradually, the point that the measured house landing Apollo program is simply the best possible focal point for this effort in its present phase is emerging from the verbal protobabble of the current debate. It is becoming more readily apparent that Apollo is not just as "over Niagara Falls in a barrel" type of devil-doll sheet, but a well-conceived program of broad exploration across the whole spectrum of space technology as we know it today.

The solid technical success of the Mercury program, particularly in the two 22 orbit flights of Col. Schriener and Maj. Cooper, has done much to make this point clear. It should be obvious now that Mercury, Gemini and Apollo spacecraft are really the Nova, Pinta and Santa Maria of space exploration, and are simply proving the way for whatever useful purposes this nation eventually decides to utilize space.

The Fiscal 1964 NASA budget, which will be one measure of how fast this program of space exploration will progress, looks rough but not too crippling treatment

in its passage through the legislative mill on Capitol Hill. Congress is still strongly behind the basic purpose of the national space program. But it can no longer afford to give NASA the running, block check votes with which it supported the Fiscal 1963 budget. This loss of congressional support was valuable in providing NASA with its initial acceleration, so it could take full advantage of the technical momentum that built up so rapidly in the past few years. But it is not the type of support that can or should be expected as routine.

Congress must cut the NASA Fiscal 1964 budget to constrain its constituents that it is exercising prudent control over their tax dollars, as well as to discourage any government agency from anticipating a blank check for all of its dreams or whims. So far, NASA officials have been singularly obtuse in understanding this congressional mood. They have apparently taken the mere fact that Congress wants to pass anything from space as an endorsement to their managerial ability. Consequently, they have failed to cooperate with their legislative committees in arranging relatively small and highly selective cuts that will not affect the pace of the top-priority programs—particularly Apollo. As a result of this rather foolish tactic, NASA is likely to get a larger across-the-board percentage type-cut that will either nudge the edges of the top-priority programs, or force NASA into a series of re-programming to protect its key projects—an action that is certain to cause further ire on Capitol Hill.

The issue between NASA and the Congress is not whether the Fiscal 1964 budget will be cut, but what kind of a reduction NASA can absorb best—a broadly selective pruning that can be done well only with NASA cooperation, or an across-the-board *Archie* slash that is the only response of Congress when dealing with technical matters too complex for specific judgments.

## Debate's Main Issue

There will continue to be carping from the wings from some elements of the scientific community who feel the space program is diverting funds from their pet areas, but we do not feel these scientific bashfuls have convinced any significant members that their criticism is valid. Neither did NASA's counterblast from eight "tame" scientists (see p. 24), almost all of whom have some official NASA connection, help anybody. But this is hardly genuine to the main issue of the current debate, which is how effectively NASA can make its budget through Congress to provide the funds to keep its major technical program rolling as fast as technical progress will permit, and whether it recognizes how the skill and judgment to give up some of their less-essential plans to preserve the main core of the space exploration effort.

—Robert Hottel

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## WHO'S WHERE

### In the Front Office:

**Melley B. DeBorja**, president and a director, General Dynamics Corp., Van Nuys, Calif., succeeding the late George H. Noble.

**Sam Taylor**, president, Vought Air & Marine Corp., Johnstown, Pa., succeeding Edward G. Vandenberg, vice president.

**William A. Sappelt**, vice president and general manager, Lear Jet Corp., Wichita, Kan.

**Charles D. Dunn**, vice president and chief executive, Honeywell Inc., New York, N.Y.

**David T. Lewis**, vice president and director, Boeing Co., Everett, Wash., succeeding **W. H. Tamm**, vice president and director, Boeing Co., Everett, Wash.

**G. L. Woot**, Jr., marketing vice president, Air Industries Sales Co., New York, N.Y., a division of Air Industries Corp., Inc., succeeding R. A. Tamm, Jr., vice president.

**John E. Tamm**, executive vice president, Tamm Equipment, Inc., aerospace subsidiary of Tamm, Inc., New York, N.Y.

**Charles D. Hargrove**, senior vice president, United Nuclear Corp., Washington, D.C.

**Joseph A. Fagan**, vice president and general manager, West Coast operations of General Dynamics Corp., Inglewood, Calif.

**Ralph E. Rasmussen**, senior vice president, Avco Research Corp., Ann Arbor, Mich.

**Dr. Raymond Friedman**, vice president and chief executive, responsible for the Guidance and Control Division, Northrop Engineering Div., Northrop Industries Corp., Flight Sciences Laboratory.

**S. J. Kahan**, president and chief executive, Avco Research Corp., Ann Arbor, Mich., succeeding John A. Lewis, vice president.

### Honors and Elections

**Dr. Raymond H. Wilson**, Jr., chief of applied mathematics in the Research Division of NASA's Office of Advanced Research and Technology, has received a \$500 monetary award for completion of a method for magnetic steering of spacecraft he completed this morning. Dr. Wilson's work solved the problem of steering and controlling a spacecraft during its launch and orbit in the earth's magnetic field.

**Amelia M. Beach** has been named a Fellow of the Academy of Applied Sciences. She is the independent manager of the ground control system which is used on Mercury and other U.S. manned and unmanned vehicles, including Titan, Titan II and Titan III.

**Mr. Gus Eric Fink**, commander of the Air Force Space Station, Dr. Edward Tamm, Jr., vice president and director, Boeing Co., Everett, Wash., Dr. John F. Kennedy, on behalf of Space Station, Dr. Kenneth P. Taylor, and Dr. William A. Sappelt, Jr., vice president, Lear Jet Corp., Wichita, Kan., are among the distinguished members of the Air Force Space Station.

(Continued on page 98)

## INDUSTRY OBSERVER

**Fast Mach-3 built Titan 2 launch vehicle for National Aeronautics and Space Administration's Gemini program** will be installed in the main launch vehicle cell at the Baltimore plant for work. Complete system tests, jet fueling and engine firing, will follow, including electrical system checkout, measurements of heat loads and analysis of the multistage detection system.

**Fisher Fleet 1964 Navy purchase of the Grumman A-1H Intruder** two-place, single-engine aircraft will be for Marine Corps use. Navy hasn't received officials of the Office of the Secretary of Defense that this level of attack aircraft is best for carrier use on a basis of cost-effectiveness analysis.

**U.S. Navy** is now estimating that the Russians are operating 55 non-Navy and 71 Navy oceanographic vessels, compared with 38 non-Navy and 35 Navy oceanographic ships operated by the U.S. Navy has requested \$187 million for its oceanographic work in Fiscal 1966, but has said that the present mapping of the sea is a major concern in terms of the major ship type order placed by Polaris-class submarines. Defense Dept. trimmed the request to \$200,000.

**New techniques for development of an all-weather landing system for Army** have been developed and will be sponsored in a program being conducted by Army Electronics Material Agency. Army has issued requests for proposals.

**Representative program aimed at developing a 10-lb. jet-propelled engine for spacecraft propulsion** will be carried out by Avco's Research and Advanced Development Div. under contract to NASA's Lewis Research Center. The center also is negotiating with General Dynamics/Avco for an investigation aimed at development of a small plasma gun for space propulsion.

**Major aircraft accident rate for USAF** continued its downward trend through Fiscal 1962 with a figure of 5.7 accidents per 100,000 flying hours. Rate for 1961 was 6.5 per 100,000, for 1960 it was 15, and for 1959 it was 33. Major accidents decreased in number from 440 to 393 from 1961 to 1962, fatalities decreased from 347 to 296.

**Avco is experimenting with what it calls "multi-year lease"** in the hope of simplifying the cyclic usage in government contracts. The idea is to contract the service to buying an item from one contractor for a time up to three years after the last contract is awarded, rather than holding a new competition before the entire purchase is completed.

**Dynamic analysis of nonlinear missile configurations—staged like a double-coiled line—will be conducted by General Dynamics/Proton under Army Missile Command contract.** Army also has awarded a 12-month study contract for research on hypersonic aerodynamic control to General Applied Sciences Laboratories, Wallingford, N.Y.

**Increasing T14-L6 turboshaft engines in the Aero-Flite B-1000 UH-1 helicopter** are being installed over 1000 ft., compared with 150 ft. for turbo-propeller-engined four years ago. Maintenance cost per flying hour for the UH-1 is \$130. The figure compares with \$45 for the Bell UH-1B Raven 557 for the Sikorsky UH-1C Chieftain, \$120 for the Boeing UH-1C CH-13 Sea King, \$110 for the Sikorsky CH-53 Sea Stallion, and \$100 for the Sikorsky CH-53E Sea King. Costs include all military and civilian labor and for transportation, field and depot levels of maintenance, plus costs of airborne overhaul and consumable parts.

**Difficulties in obtaining a standard specification during the space vehicle development cycle** is illustrated as the changes and modifications made during the Mercury program. Mercury Atlas-7 incorporated 85 changes from MA-6, MA-6 had 149 changes from MA-7, MA-7 included 149 changes from MA-9 capsule incorporated 159 changes from the MA-6 configuration. Total program cost through MA-9, including the changes, is \$314.2 million.



The PERT analyzer (top left) reviews the dashed-line critical path on the CODED MARK II display. He uses the joy stick to indicate with a small circle the activity or path to be revised. The new schedule estimate is inserted by push-button control.



A revised display (lower left) is generated automatically by the computer, and indicates the new critical path. Thus, program managers need not fumble for an hour for effect of proposed changes. The results of this "real-time" PERT analysis are then presented by an electronic computer printout showing new estimates for the development team.

**CODED MARK II**, a second generation Computer Operated Electronic Display, applies the combined brain power of man and machine to the solution of space age problems. Other applications of the MARK II, in addition to PERT analysis, include real-time displays of helicopter flight control, lunar vehicle steering, missile guidance simulations, satellite thermal response, and polynomial curve fitting. Engineers interested in projects applying advanced display techniques are invited to contact our Personnel Director, Bendix Systems Division, Ann Arbor, Michigan—an equal opportunity employer.

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## Washington Roundup

### Moss on Sylvester

Arthur Sylvester failed to persuade Chairman John E. Moss of the House special information subcommittee that there is any real justification for the Defense Dept.'s secrecy rules covering Russia space launches and Pentagon operations with newsmen. After a closed hearing last week, Rep. Moss said he is so disgusted that releasing information about Russian launches would, as Sylvester claimed, reveal too much about U.S. trading capabilities (see p. 28) that he is going to explore the matter further with other Defense Dept. leaders. He also will ask civilian space agency officials to assist themselves even on this issue, instead of accepting the Pentagon's secrecy policy.

Subcommittee member Gene Sylvester a month time during the closed hearing about his knowledge of Defense Dept. information activities, complaining at one point that he denied making statements that were later shown to be on a topic recording of his records (AW Jan. 24, p. 118). Rep. Moss said fully that Sylvester's disclosure regarding Defense Dept. personnel to report their own criticism to him should be recorded since "it serves no useful purpose." Rep. Moss said that of 1,319 news contacts reported under the directive, only one was unaccepted.

Rep. Moss said if Sylvester released as much information as practical during the Cuban crisis, however, the subcommittee chairman controlled the Defense Dept. should have allowed newsmen to do more on-the-spot reporting.

### White Sands Campaign

President Kennedy is to visit the White Sands, N.M., complex June 5. The New Mexico congressional delegation will be on hand to argue for a bigger space role for the state.

Glennia Clinton P. Anderson of the Senate space committee long has argued that the National Aeronautics and Space Administration as well as the military should make more use of the well-ventilated facilities of White Sands and Holloman AFB. Sen. Anderson succeeded in getting the Proving Grounds, N.M., Scientific Laboratory last year, but the visit did not result in the longed-for conversion of Target Range (AW Dec. 17, p. 28). Sen. Anderson was not space committee chairman at the time, however.

The President will view aerial firings at White Sands, and the next day will fly to inspect the aircraft carrier *Oriskany* and *Kitty Hawk* off of Ft. Meigs, Calif. On June 10, he is to watch other missile firings at the Naval Ordnance Testing Site at China Lake, Calif.

Watch for NASA to include a test pilot with a heavy scientific background when it selects another group of astronauts—probably about next-fall missions. The hopefully would appear some scientists now assisting the space program.

### Aircraft-for-India Policy

U.S.-British policy for the next 18 months calls for improving what aircraft India has rather than relying on any full-scale procurement program. But there will be continued attempts to improve India's ability by providing aircraft that can be used by the U.S. and Britain.

U.S. is sending 24 Fairchild C-119s from Air Force reserve squadrons in India as part of this aid program. India already has about 50 C-119s, about half of them equipped with jet thrust augmentation (AW Nov. 12, p. 127). The additional C-119s will not be equipped with jet engines, but are scheduled to be Fairchild's series facility in St. Augustine, Fla., before they are flown to India.

There are no plans at present to give India U.S. or British supersonic fighters, but no-tail number will be supplied for coming aircraft. U.S. officials say they are using the Pentagon's "non-interference" approach in determining what weapons to send to bolster India as its border conflict with Red China. About \$120 million in military aid to India already is committed, with the U.S. and Britain splitting the cost.

### Navy Procurement Boos

Shifting Vice Adm. William A. Schoech from deputy chief of naval operations for six to chief of naval material is the first step toward his appointment as procurement chief of the macroscopic Navy, when he will have the title of chief of naval support. In the position, the business of weapons, ships, tools and docks and supplies and accounts, which now report directly to the secretary of the navy, will report to him.

Only the board of personnel and machine and supply will report directly to the secretary under the new setup. Adm. George W. Anderson, outgoing chief of naval operations, unsuccessfully pressed Navy Secretary Paul Kern to get the procurement business under the CNO's aide. Anderson argued that was the best way to assure that the CNO could implement the weapon requirements he generated.

Rep. Daniel J. Flood of the House Defense Appropriations Subcommittee is demanding that Navy leaders write tighter procurement contracts. He told Navy leaders during a recent hearing that "you have a lot of track down there disguised and wearing uniforms of JAG (judge advocate general) officers who look at some of these contracts . . . just contracts are so open a patch of the peace could drive through with a truck."

—Washington Staff



# Sen. Anderson, Scientists Rebut Attacks on Manned Lunar Landing

By Alfred P. Ackerson

Washington—Sen. Clinton Anderson (D-Mt. W.) chairman of the Senate space committee, last week expressed strong support for Project Apollo and said some critics of the manned lunar program, including prominent scientists, are "misguided and misinformed."

Earlier in the week, a group of right scientists, three of them Nobel prize winners, also defended Apollo as a national goal important both to national security and advancement of the state-of-the-art technological and scientific capability.

Sen. Anderson's Apollo speech on the Senate floor was the most favorable he has made on the subject since recording the late Sen. Robert S. Kerr as chairman of the Senate space committee early this year.

Sen. Anderson also expressed pointed criticism of Apollo made in a statement by the Senate Republican Policy Committee entitled "A Matter of Honor." The statement said that Apollo was a wasteful crash program of doubtful value which will contribute nothing to the nation's security, and only a "herring, political victory."

"The decision to try to land a man on the moon by 1970 does not constitute a crash program," Sen. Anderson said. "What is the reason for the increased expenditures when a specific goal is set? [The objective] was chosen . . . that would permit us to work . . . as a nation, yet efficient manner."

Sen. Anderson said the space race is a challenge as important as the military challenge.

## Snap 10A Re-entry

Washington—Scientists last week said a satellite of man reentered Snap 10A which was thrown back into the atmosphere at a velocity of more than 11,000 mph.

The satellite, National Science and Space Administration reported last week.

Morning rocket weighing 402 lb. was launched on a Scout rocket from Wallops Island, Va. on May 12, and on May 21 at 160 mi. (AW May 27, p. 51, Apr. 22, p. 54). The rocket reentered about 1750 on May 26, 1969, on its 10th orbit at 160 mi. Orbital observation from Bermuda indicated that components designed to disintegrate on reentry burned as the rocket glowed through the atmosphere.

of the U.S. The momentum and significance of the lunar program are derived from its place in history as a step toward exploration of the solar system. The best of these plans is ours in space."

Project Apollo has become a very complex and an evolving difficult project as the scientific community, politics and some understandable reluctance to commit billions to an endeavor which promises little in immediate, tangible benefits.

Representative bills continue to make the space program a prime political issue. They have called for costs as high as \$240 billion in NASA's budget, observing that such program scientists are opposed to Apollo.

Democratic leaders on both the Senate and House space committees have said they will sustain the NASA budget limits and cut out everything that cannot be justified. This has been somewhat interpreted by some as last ditch before the NASA program.

Leaders of both committees would be in a position to assure members of their respective bodies that the budget they are then to approve is an "honest one."

Space committee Democrats—and some Republicans who believe in the space program—felt that the budget would be so big that the NASA administration will prevent a much larger and deeper cut in the appropriations committees is on the floor of the House and Senate.

House space committee leaders have tried to enlist NASA's help in making selective cuts in the authorization, but have not been successful.

"We tried to get them to tell us what could be cut out," said Rep. Otto E. Torgler (D-Tex.), chairman of the House renewed light subcommittee, "but we haven't had much luck, so we're going to take it to the voting members."

## West Food Progress

International communication of ocean, telegraphic and high speed digital data in addition to land signals from existing optical links was reported to be completed for limited periods of time at the annual meeting of the European West Food conference (AW May 26, p. 14).

The limited transmissions were not intended to disrupt trading regime, which means that the satellite system being long-hauled Comsatcom transmission in the northern latitudes is expected along the belt is fast forward according to efforts at Massachusetts Institute of Technology's Lincoln Laboratory which is conducting the experiment for the Air Force.

# NATO to Share in SAC Nuclear Planning

Ottawa, Canada—Creation of the North Atlantic Treaty Organization overhauled coastal forces—and an allied staff to direct it in conjunction with the U.S. Strategic Air Command strike force—was hailed by U.S. officials as a major step forward after the three-day NATO anniversary conference here.

Secretary of State Dean Rusk said the strike capability acquired by the force (AW May 21, p. 27), which has been assigned to NATO's Supreme Allied Commander in Europe (SACEUR), represents more than just a paper move.

The reinforced force, which was cut off ideologically and left command to a general staff within the defense, will consist of three U.S. Polaris submarines, Great Britain's 100 aircraft V bomber force and the lighter bomber squadrons of six other NATO member nations.

"This [force] adds to the expertise of SACEUR . . . to get at those targets that are threatening Western Europe," Rusk said. "It also means that the allied staff will participate in the direction of three forces and that an allied staff, for the first time, coordinate these forces with other forces, say those of the Strategic Air Command," in Quebec.

"Now, this is a major step forward for the alliance, in my opinion, and represents an enormous increase in the strategic capability of NATO, if called upon for defense purposes," the secretary of state added.

Rusk said that the presence of an allied staff in Ottawa participating in the operational planning for the nuclear force is itself a major step in making nuclear responsibilities among the allies.

"The importance of this principle ought to be more accurately identified than to just speak of it vaguely," Rusk said and obviously referring to the fact that the allies after all have had not been given a formal name.

Leaving the force members and its operating rules an informal collection of its members were diplomatic counterparts designed to watch the French, who opposed formal organization of the force because it would interfere with their plans to develop their independent nuclear strike force.

Great Britain had been expected to take an opposite view and push for formal creation of the force, once political pressures at least following the recent Nassau agreement with the U.S. dropped away.

The conference presented a political squabbling among the allied superpowers.

two, however, and left the extent and importance of future participation by the allies open to various interpretations.

Rusk pointed out that the force had in fact been organized and agreed to be reached an agreement of a deputy to the NATO commander to help direct the force and that personnel had been made for participants by allied officers in nuclear planning staffs both at the NATO command level and in Ottawa.

When asked to define the contribution the force will make to the NATO defense Rusk said that for the past year the U.S. has been using the force as often as "economic analysis of new information in the nuclear field so that the NATO governments can think collectively and coherently about nuclear problems."

The creation of a Soviet strike force, capable of hitting Western Europe and the United States, has introduced a new element in the situation in Europe. "In my view," he said, "it is not that these governments who are directly involved with defense problems against such Soviet strike capabilities must themselves have full information in order to think hard and reflectively about it."

Despite the new emphasis on exchange of information and the increased scope which will be given the allies in planning and strategy, it was pointed

out that the U.S. will still retain control of the major portion of nuclear weapons which will be assigned to the new force. Since the nuclear force will be under the control of the NATO commander, Gen. Lauris Norstad, full authority to use nuclear weapons still will rest with President Kennedy.

Increased participation by NATO officers in major planning at SAC headquarters also will mean putting SAC units under control of the new NATO command. Officers from at least seven NATO countries will take part in target assignments made by the SAC target planning staff plus planning agencies only in a representative from Britain and one from Canada, but will increase no control over SAC strike units.

A NATO withdrawal force also was discussed during the three-day conference, but its formation was not pushed for the same political reasons which necessitated only a vague reference to the full manifestation of the inter-allied force.

The multinational force would consist of fully integrated forces with multi-nationality crews manning Polaris-equipped surface ships and submarines. Increased control of nuclear weapons would be shifted to allied states as would an increased share of the financial burden. Under the traditional command control structure, allied nations also would have a larger voice in

## Pravda Cites MA-9's 'Serious Troubles'

Soviet newspaper Pravda's article on the 23-hour MA-9's flight at May 1969, cited a number of low Russia reports U.S. space flights. The headline was "Serious Difficulties."

Following is the complete text: "The American press has covered new details of the space flight by Gordon Cooper. In particular, the newspapers note that there were serious troubles in the early hours of the flight."

As has been known from dispatches received from the aircraft carrier "Kosygin," which piloted the capsule containing Gordon Cooper from the Pacific Ocean and took the command to the Houston Mission. Cooper experienced serious difficulties in taking fuel and water during the flight.

Cooper's doctor declared that the command "is in good condition" and last week's events during the flight. As this week, the doctor's note was caused by the fact that Cooper could not use his supplies of oxygen during the night due to difficulties with the containers which was specially designed to prevent drinking liquid in a weightless condition.

The newspaper declared not to use his reserve supply of liquid which was intended only for emergency.

The newspapers pointed out that the food supplies aboard the craft were depleted and packed in containers which had a device for drying the water necessary for restoring the food's normal consistency. When this device also did not work, Cooper could not get a sufficient amount of food. The press emphasized that one of the purposes of the new flight, "Mission," was to test the possibility of using the spacecraft's automatic control system which would act in emergency during the flight when manual control will be to change them (food containers) devices so that the astronaut can eat normally during flight.



## Soviet Answer to U-2 Now Operational

argument and use of the force.

Cosmos 18 entered in operation of such a force was registered during the Ottawa meeting, especially on the part of the British.

British participation in the multilateral force is a natural extension of the Vienna agreement between British Prime Minister Harold Macmillan and President Kennedy, which provided for submission of British assets for the new-cancelled Douglas Skybolt missile. Britain had intended to purchase the Skybolt to prolong the effective lifetime of its V-2s missile force.

High U.S. officials and documents of the multilateral force will continue on a bilateral basis with NATO allies. It was indicated that a full discussion of the multilateral force will be taken up in December at the next round-table round meeting in Paris.

Between now and the Paris meeting

officials and news details, such as operations concerning control and ownership of nuclear weapons, will have to be worked out on an individual basis with those NATO nations which have said they agree in principle with the multilateral concept.

No government has said it definitely would go ahead regardless of the settlement of these basic questions regarding

the agreement of the multilateral force and official aid.

Questions concerning the balance of nuclear armament versus the conventional armament in NATO's defense forces also were discussed during the conference. Prior to the meeting, there was a wide variance in thinking on the need for maintaining a conventional defense capability in Europe.

The U.S. view generally was that the NATO forces should be prepared to withstand a Soviet conventional attack on Western Europe for 90 days without having to resort to nuclear weapons.

General feeling among European military officials was that a full-scale 1960s conventional defense capability was more realistic. The question of what constituted balance in the NATO forces was not discussed extensively, but in their final communique the



viated a description of the Soviet Union's answer to the U.S. Lockheed U-2 high-altitude reconnaissance plane are shown on these two pages. The plane is now operational with the Red Air Force and is capable of flights over 10,000 mi. range at altitudes above 60,000 ft. in subsonic cruising speeds. Known colloquially as the "Uda Yevdok" (this aircraft is believed to be the work of the design team headed by veteran Soviet designer Alexander Yakovlev). The aircraft is about 60 ft. long with an extremely high aspect ratio wing of about 50 ft. span comprising very closely with that of the Lockheed U-2. Gross weight is estimated at about 25,000 lb. and it is provided by two axial flow turbojets installed for extremely high altitude operation. It is apparently equipped with a boost-type landing gear similar to that used on the Yevdok-1 Phantom II fighter fighter series. It is flown by a single pilot and carries a complete payload of photo and electronic reconnaissance gear. No nations of this aircraft have yet been made over U.S. borders.

NATO ministers, and the need to achieve a satisfactory balance between nuclear and conventional arms was recognized.

The permanent council was directed to consult with NATO military authorities and specialists. Further studies of the interrelated questions of strategy, force requirements and the means available to meet them.

According to those officials, these studies may be similar to the conference studies which have been completed by Secretary of Defense Robert S. McNamara to determine the relative value of U.S. military programs. One noted with this will be discussions about the vehicles in the acceptance of financial responsibilities within the alliance.

Political discussions occupied a portion of the multilateral agenda with NATO representatives expressing their

view on subjects ranging from general East-West relations, to specific discussions of the situation in Laos and North Africa. Disarmament, the nuclear test ban negotiations and the possibility of signing a non-aggression pact between the NATO nations and the Warsaw Pact nations also were noted. No positive recommendations were made on these points.

Most positive overall result of the conference from the U.S. point of view, one official said, was a general realization that the U.S. commitments to the defense of Europe are solid.

"With 400,000 U.S. troops stationed in the NATO area and the growing participation by the other NATO nations in development of nuclear policy with the U.S., there can longer be a need for confirmation that the United States is in Europe to stay," the official said.

## Alabama Firm to Build Saturn Launch Towers

Cape Canaveral-Bagley Bros. Works Co., Birmingham, Ala., has been chosen by National Aeronautics and Space Administration's Launch Operations Center to build, in manufacturing, three launch-tower-like towers for Saturn 5 vehicles.

The mobile platforms, upon which Saturn 5 Apollo-combinations will be assembled and later launched (ENR, 4/26/66, p. 55), will each consist of a 250-ft. tall, 100 x 115-ft. launch table and a 150-ft. tall auxiliary tower. Each tower is expected to weigh about 40 million lb., without the Saturn-Apollo Apollo, but of 512 ft. minus was the lowest of 10 vehicles and about 51.5 million lb. minus. Apollo-combination of 512 ft. minus must complete the three units within 18 months after the start

# U.S. Secrecy on Soviet Launches Scored

Washington—Intense inquiry by the House subcommittee on government information is placing space agencies and Defense Dept. officials on the defensive in explaining their policy of withholding information on Soviet space activities not reported by the Russians.

A principal witness was Dr. George L. Simpson, Jr., assistant administrator of the National Aeronautics and Space Administration, who is responsible for "technology evaluation and policy planning," including dissemination of information (AVF May 27, p. 21).

He told the subcommittee that the Satellite Situation Report published by NASA includes information on all classified U.S. and Soviet space launches. He said reports on foreign and Defense Dept. launches depend on unclassified information supplied by the North American Air Defense Command (NORAD).

Under a policy established about six weeks ago, the Satellite Situation Report now contains information on:

- Foreign space activities authorized for release by the office of the assistant secretary of defense for public affairs.
- Foreign space activities officially reported by the United Nations Register, if classified by NORAD.

• Foreign space activities, including failures, which have been publicly announced by the United Nations government and classified by NORAD.

Simpson's statement angered Rep. Porter J. Hall, Jr. (D-Vt.), chairman on this subcommittee.

Rep. Hardy Yeo, ... are going to tell us about things that foreign governments have publicly announced? Was that a real fair help you are giving us? Do you see how little the defense thing is?

Simpson: Yes, sir.

Rep. Hinde: If you have any source of information other than the Defense Dept. ... you can't tell the public under the office of the assistant secretary of defense for public affairs. So, he has got a lock on you pretty doggone tight, hasn't he?

Simpson: Yes, sir.

Hinde: I don't know why you are in the subcommittee business if the Defense Dept. is going to exercise this kind of control.

Rep. George Moulder (R-Mich.): Does NASA consider the right of the Defense Dept. to prohibit NASA from publishing information about foreign space activities which have been made public by those foreign governments themselves?

Simpson: Yes, sir.

Rep. Hardy: Public information provided by foreign governments is being suppressed by NORAD and you are not permitted to release it to the American people?

Simpson: This has happened. It is not our case.

Hardy: ... it looks to me as though there is some deterioration of data in NASA.

Rep. John E. Moss (D-Calif.), subcommittee chairman, said he wants to determine whether the Defense Dept. and NASA are justified in withholding information on Soviet space launches. He said that other information on foreign space activities is "vital to public understanding of U.S. and Russian space efforts."

Subcommittee members pointed out that the policy on the amount and level of information made available in the Satellite Situation Report has not been consistent. The report once contained information on all launches about which the U.S. had tracking information, or about which the Soviet Union had made available information. In 1962, the Defense Dept. drastically reduced the amount of information it supplied on U.S. military and Soviet launches. Then, six weeks ago, the policy was liberalized, as indicated by Simpson.

The subcommittee also pointed out that NASA Administrator James E. Webb last September found it possible suddenly to change the existing policy and report to the chairman of the Senate and House space committees on six Soviet launches in attempts to "level" cooperation by Moscow and Vienna (AVF Sept. 10, p. 34). Webb's report was delayed, listing dates, spacecraft weights and whether the launches occurred but four months into earth orbit as in eye from from earth orbit.

It was suggested that since the information was provided so quickly following the request from the space committee chairman the request might have been approved by NASA. At the time Webb disclosed the six Soviet launches, NASA had failed in two attempts to launch Ranger spacecraft to the moon and is now about to send a Mariner spacecraft on a Venus fly-by mission. The second Mariner spacecraft was launched on Aug. 27 and was on its way to Venus when Webb reported the Soviet failures.

Principal reasons given by the Defense Dept. and NASA for withholding information on Soviet space failures are that such reports reveal information on U.S. handling capability and that disclosing Soviet space failures embarrasses the Russians, threatening U.S.-Russian space cooperation.

The Moss subcommittee has shown an inclination to accept these reasons



Prototype of the Saab 105 two-place, delta-wing and tactical aircraft (AVF July 3, 1962, p. 17), recently was rolled out at Södabron in Linköping, Sweden. Above, the aircraft carries two Saab-designed all-terrain missiles under the left wing.



## Saab 105 Shown in Liaison, Attack Configurations

Saab 105 also can be armed with 12 Bofors 15.5-cm. air-to-ground missiles, one under each wing above. Below, aircraft is shown in liaison, rather than ground-attack mode, with outlying pylons retracted. Swedes no longer have to order a succession of 150 aircraft at a time performance specifications. First flight is expected in July. Executive version of the privately financed aircraft would be offered at a lower price point. Aircraft shown is the first of two prototypes, both built with production tooling. Engines powering the Swedish aircraft are two Westinghouse J40 turbojets.



### New Tiros Coverage

Washington—Weathered Tiros meteorological satellite, a new concept to be studied by Radio Corp. of America under a National Aeronautics and Space Administration contract awarded last week (AVF May 15, p. 37), would be able to photograph even snow on earth at least a day from polar orbit.

The satellite is conceived as a conventional Tiros that has been tipped 90 deg. so that its optics are perpendicular to its orbital axis, giving the appearance of a wheel rolling along its orbital path. Two wide-angle vidicon cameras, similar to those used in present Tiros, would be mounted back-to-back looking out from opposite sides of the satellite's rolling rim.

The satellite would spin about its rim at approximately 12 rpm, enabling one of its two cameras to photograph 900,000 sq. mi. of earth's surface every 30 to 60 sec. Pictures would be stored on magnetic tape and sent out in compressed form when satellite comes within range of a ground station.

The rolling wheel configuration is a polar orbit would enable the camera to obtain continuous earth surveillance. Conventional Tiros, which spin, cannot take pictures of the same area in view each for one-quarter of each orbit.

### CL-84 Engine

Canadian, Ltd., has recommended to the Canadian government that the Licensing Tiros independent report be used as the Canadian CL-84 two-engine V/STOL transport (AVF Jan. 28, p. 18), replacing the Canadian VFW & Wijk. The report is being actively chosen.

Decisions to request the engine change for the CL-84, which is being financed with a \$7.5-million government allocation and \$2.5 million in company funds, were made following a change in aircraft requirements for the aircraft.

Previously, the aircraft was designed for liaison and reconnaissance missions, but the CL-84's new utility role will include armed helicopter escort, search and rescue and V/STOL training. The armed escort mission will require attachment of bridge stems and a greater aircraft weight.

Weighted size of the Tiros engine by Agan, considered Canada's best potential candidate for the search, also will exceed the decision.

The Tiros offers a 1,130-hp, compound with the PT60's projected 600 hp.







## U.S., Canada Might Revise Bilateral Pact

By Donald E. Fink

Ottawa, Canada—Disagreement between U.S. and Canada over airline service between Toronto and Buffalo has renewed talk of renegotiating the U.S.-Canada bilateral air transport agreement, which Canadian officials contend is outdated.

Canadian Air Transport Board and the Office of the Secretary of State for External Affairs are expected to approach their counterparts in the U.S. in the near future and ask for pre-negotiation discussions.

A major aim will be to obtain major U.S. flight routes such as Los Angeles and San Francisco, southern cities such as Dallas and Birmingham and points to Miami.

The Toronto-Buffalo route dispute stemmed from U.S. attempts to license Eastern Air Lines and Midwest Airlines to serve the two cities. American and Trans-Canada Air Lines were licensed to fly the route under the original 1949 agreement.

American served the two cities with three to six Toronto to New York flights, but gradually reduced the service and finally asked to terminate it because of declining services. TCA has never returned service to the route.

## Midwest Licensed

The route controversy was settled late last month, when Canada agreed to license Midwest on the Toronto-Buffalo link. Midwest, whose application was under consideration by the Canadian government for almost a year, will begin service on the route June 17, complying with America's notification of service.

Midwest will serve the Toronto-Buffalo route with their daily flights each way. The flights departing Toronto will leave at 7:15 p.m., 9:40 p.m. and 6:15 p.m. All will terminate in Boston. In addition to Buffalo, the Toronto flights also serve Rochester, Syracuse, Albany, Hartford and Providence, but no single flight will make all the stops.

Two of the return flights, 7:40 a.m. and 6:05 p.m., will originate in Boston. The third, at 6:15 p.m., will originate in Albany. Arrival times at Toronto will be 11:40 a.m., 7:00 p.m. and 9:45 p.m.

The Eastern application was rejected by Canadian air transport officials on the grounds that the route would give Eastern a Toronto to Miami connection in addition to its Montreal to Miami route. Trans-Canada presently serves Toronto from Toronto and, for several years, has made unsuccessful attempts to get a Miami route from either Toronto or Montreal.

U.S. air transport officials agreed to require a two-stop restriction on Eastern flights out of Toronto, requiring

the airline to stop at Washington, Philadelphia or a comparable city after leaving Buffalo.

The two-stop restriction, coupled with the fact that the 3,000- and 2,600-lb. maximums at Buffalo are too short for heavy jet aircraft, would prevent Eastern from operating a Toronto-Miami flight. Such a flight would not comply with TCA's Toronto-Tampa flight, the U.S. officials contend.

Despite the two-stop restriction, Canada accepted Eastern's recent request and permits from U.S. officials that the airline submit the bilateral agreement. Under the agreement, both countries are free to license a carrier or carrier to fly certain agreed-upon trans-border routes. All income from such routes is also apportioned by the same action.

Canada's objection to licensing Midwest also involved another problem of trans-border traffic from Toronto, in this case to Midwest's main structure in the New England area.

Canadian officials at first required that a 148-seat-wide aircraft, such as the one licensed on Midwest, in accordance with Section 1 of the bilateral agreement agree. This states that "the air transport facilities available to the traveling public under this agreement and under such laws have close relationship to the requirements of the public for such transport."

The 148-seat-wide aircraft was what Midwest had anticipated in its license application. The restriction was imposed by U.S. officials. They argued that it could not be imposed because Midwest had gained much experience on the route to decrease the requirements of the traveling public.

Canada lifted the 148-seat limitation and granted Midwest an unrestricted license, but waived the right to impose a restriction at a later date, under the provisions of the bilateral agreement.

The bilateral agreement, first formalized in 1949, has not been altered since 1959. It is in this point that Canada is lodging one of its major objections.

The Canadian contention is that the agreement is out of step with the times because the route was granted when the DC-3 was TCA's principal air-

craft. TCA also was the only Canadian airline in existence at the time.

Since then, Canadian Pacific Airlines, a privately owned carrier, has begun its Montreal-CFPA routes. The U.S. air flights from Canada to Mexico and also stops at Honolulu on flights to Australia, but has no routes to cities on the continental U.S.

Canadian officials also point out that the airline agreement has an undesirable economic balance for Canada and leaves TCA to relatively short hauls with the exception of the Tampa flight. These short-haul Canadian passengers are required to do short hops across the border and transfer to U.S. airlines to reach most major U.S. population centers.

Under the original agreement, Canada was given 10 routes, while the U.S. obtained 16 in return. U.S. flights served by TCA include New York, Chicago, Boston, Seattle and Tampa. U.S. carriers serve all of Canada's major population centers—Montreal, Toronto, Ottawa, Winnipeg and Vancouver.

## Fact Amended

In 1977, the agreement was amended, giving the U.S. eight additional routes and deleting one. Canada was given six additional routes.

To bring about a more favorable balance in the bilateral agreement, Canadian officials are now negotiating.

- Increase TCA connections with major population centers throughout the U.S., instead of a few selected centers.
- Make all routes that generate no passenger traffic drop within the U.S. double-track routes served by both the U.S. and Canadian carriers.
- U.S. position is that the agreement establishes a free exchange between the two countries and that Canada would have to be prepared to trade route extensions with the U.S. in return for increased routes to U.S.

Canadian officials concede they have little to trade, since they are carriers of their own geography, which puts a major portion of Canada's population in the U.S. and Canadian border. The U.S.-Canadian border, and further eastward, is in the center sector.

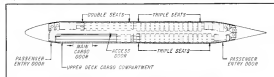
This maintains it is easy for the U.S. to serve all major Canadian population centers with relatively few flights, while Canada can serve only a few of the big U.S. population centers with the routes it receives in return.

This is countered by the U.S. argument that U.S. carriers do not serve major population centers in Canada. The U.S. main system is that



Northwest Orient Boeing 707-351B Cabin Layout Shown

Cabin arrangement which allows portion of the upper deck of a 707-351B to be used for large cargo items will be inaugurated in the 707-351B service between Toronto and Buffalo. The aircraft will be able to carry about 100 passengers in the main cabin and 100 in the upper deck. The aircraft will be able to carry about 100 passengers in the main cabin and 100 in the upper deck. The aircraft will be able to carry about 100 passengers in the main cabin and 100 in the upper deck.



airlines indicate such connections in Great Falls to Edmonton, Seattle to Whitehorse, Boston to Montreal and Spokane to Calgary, for example.

Despite what the U.S. calls a fair exchange, Canadian officials feel the agreement should be renegotiated on a different basis than that currently, and between two countries.

Canadian officials feel that the tradition of close ties and free trade across the U.S.-Canadian border, plus the amount of trade, business exchange, and tourist flow between the two countries, should put the air transportation between the two countries on a unique base.

Official Canadian position is that the agreement should be amended and updated. G. W. McConachie, president of Canadian Pacific Airlines, which represents Canada in U.S. talks, has been positive in his objection to the bilateral agreement and has called it a "logjam" in the flow of air transportation between the two countries.

McConachie and the most frustrating exception to the international direct-flight principle between countries is the U.S.-Canadian border.

Because of an obsolete agreement between the two countries, Canadian and U.S. airlines are prohibited from providing the direct flight to both trans-border air services the traffic demands. Thus, if you can bank the legs of the bilateral air agreement, the study will benefit the airlines as

well as the traveling public, he noted. McConachie and others noted which should be reflected in Toronto to Los Angeles, Toronto to San Francisco, Vancouver to Los Angeles, Vancouver to Chicago, Vancouver to San Francisco and Montreal to Chicago.

Another example used by McConachie to point up the air transport imbalance between the U.S. and Canada is the airline system in most U.S.-Canadian routes, he notes. From most major Canadian cities, one can reach most U.S. cities via Montreal-Chicago served by Lufthansa Air France, and Atlanta, but not by a U.S. or Canadian carrier.

U.S. maintains that specific route growth rests in the Montreal-Chicago link, but has been given to foreign airlines in exchange for routes on the European continent. The route had been previously agreed upon by the U.S. and Canada.

Canada, for example, was granted the Prime Route from Montreal to Chicago for the Montreal-Chicago link. TCA has been able to fly the route, but even because it has reduced the exchange of Prime Route rights and instead of a Rome-Bangkok route.

Another factor influencing possible extension of Canadian service to the U.S. concerned charges that TCA was promoting international travel from within the U.S. A specific example concerned TCA's plan for flying from Chicago to London, an extension

of its Cleveland to Toronto flight. The U.S. pointed that Cleveland to London permission was an extension of trans-border permits.

U.S. pointed that TCA to change its Cleveland to London permission was an extension of trans-border permits. U.S. officials noted that the TCA flight to London was an extension of trans-border permits.

So-called Fifth Freedom rights granted to foreign airlines cannot operate beyond U.S. cities also are a point of contention in the U.S.-Canadian over extension discussions. Canadian officials use the example of European Fifth Freedom rights as justification for granting TCA extensions of its routes to southern cities.

U.S. feels that would mean double competition for U.S. carriers on a domestic base and possibly on through or connecting international flights.

Further complicating the bilateral agreement discussions, however, will be the fact that U.S. airlines are not used in their home base on the amount of competition that will be generated as specific routes.

Extension of TCA's route to Mexico, for example, in return for a U.S. route from Chicago to Toronto, would benefit American Airlines, which presently serves Toronto but not Eastern, which serves the Montreal-Mexico route.



# Airline Income and Expenses—January, 1963

	OPERATING REVENUES						Total Operating Expenses	Net Profit (or Loss)
	Passenger	Cargo	Other Non-Mail	U. S. & Poss. Mail	Federal Subsidy	Total		
<b>DOMESTIC TRAVEL</b>								
American	23,891	3,154	33	874		28,052	27,479	573
Boeing	4,325	232	107	188		7,862	4,779	3,083
Continental	381	18	1	2,371		3,771	2,427	1,344
Delta	12,158	834	76	309		13,377	14,474	(1,097)
Eastern	23,223	1,223	169	445		25,059	25,770	(711)
Northwest	8,241	583	54	145		9,023	7,820	1,203
Southwest	4,378	191	158	47		4,774	5,038	(264)
Western	7,433	810	37	313		8,593	8,159	434
Trans World	10,431	2,027	207	452		13,117	12,748	369
United	20,719	2,164	798	550		24,231	24,138	93
Western	4,444	537	67	159		5,207	5,102	105
<b>Trunk Total</b>	<b>191,777</b>	<b>15,154</b>	<b>1,093</b>	<b>3,300</b>		<b>210,324</b>	<b>204,394</b>	<b>5,930</b>
<b>INTERNATIONAL</b>								
American	739	43	23	8		813	728	85
Boeing	737	30	40	80		887	1,090	(203)
Continental	449	32	9	4		594	486	108
Delta	313	17	1	1		332	320	12
Eastern	9,846	148	171	48		10,213	9,893	320
Northwest	70	4	19	998		1,091	1,164	(73)
Southwest	3,893	344	192	998		5,427	5,164	263
Trans World	3,159	321	129	174		3,783	3,483	300
United	26,420	8,345	3,514	3,797		36,086	35,107	979
Western	21	1	1	1		4	4	0
Trans-Canada	455	104	241	1		1,001	1,001	0
Northwest	4,710	174	87	1,190		6,161	7,408	(1,247)
United	2	1	1	1		4	4	0
Western	216	14	3	8		241	103	138
<b>International Total</b>	<b>42,720</b>	<b>9,040</b>	<b>4,394</b>	<b>6,793</b>		<b>63,047</b>	<b>66,497</b>	<b>(3,450)</b>
<b>LOCAL SERVICE</b>								
American	1,187	87	10	53		1,337	1,338	0
Boeing	703	20	14	3		740	837	(97)
Continental	493	37	11	16		557	527	30
Delta	2,044	20	17	16		2,097	2,097	0
Eastern	1,000	20	22	13		1,055	1,055	0
Northwest	1,217	20	22	13		1,272	1,272	0
Southwest	1,189	47	30	37		1,303	1,303	0
Trans World	1,189	47	30	37		1,303	1,303	0
United	1,189	47	30	37		1,303	1,303	0
Western	1,189	47	30	37		1,303	1,303	0
South Pacific	1,189	47	30	37		1,303	1,303	0
Trans-Canada	1,189	47	30	37		1,303	1,303	0
Northwest	1,189	47	30	37		1,303	1,303	0
United	1,189	47	30	37		1,303	1,303	0
Western	1,189	47	30	37		1,303	1,303	0
<b>Local Service Total</b>	<b>10,470</b>	<b>577</b>	<b>238</b>	<b>350</b>		<b>11,635</b>	<b>11,547</b>	<b>88</b>
<b>ALASKA &amp; HAWAIIAN</b>								
Alaska Airlines	238	10	441	70		849	843	66
Alaska Central	0	12	4	19		35	35	0
Alaska Pacific	7	1014	1	1		1022	1014	8
Alaska West	14	7	0	7		31	31	0
Hawaii	480	48	171	3		702	666	36
Hawaii	480	48	171	3		702	666	36
Northwest	0	2	1	1		4	4	0
Southwest	0	2	1	1		4	4	0
Trans World	0	2	1	1		4	4	0
United	0	2	1	1		4	4	0
Western	0	2	1	1		4	4	0
Trans-Canada	0	2	1	1		4	4	0
Northwest	0	2	1	1		4	4	0
United	0	2	1	1		4	4	0
Western	0	2	1	1		4	4	0
<b>Alaska &amp; Hawaiian Total</b>	<b>1,738</b>	<b>146</b>	<b>552</b>	<b>93</b>		<b>2,529</b>	<b>2,503</b>	<b>26</b>
<b>HELICOPTERS</b>								
Chicago	27	1	1	2		31	31	0
Los Angeles	12	1	1	2		16	16	0
New York	107	5	4	1		117	117	0
<b>Helicopter Total</b>	<b>211</b>	<b>7</b>	<b>6</b>	<b>5</b>		<b>229</b>	<b>224</b>	<b>5</b>
<b>CARGO &amp; OTHERS</b>								
American	0	1	21	1		23	21	2
Boeing	0	810	1,071	0		1,881	5,373	(3,492)
Continental	0	279	363	0		642	1,372	(730)
Delta	0	1,638	1,041	263		3,942	1,811	2,131
Eastern	0	0	1,044	0		1,044	1,331	(287)
<b>Cargo &amp; Other Total</b>	<b>0</b>	<b>3,428</b>	<b>4,141</b>	<b>264</b>		<b>7,715</b>	<b>8,905</b>	<b>(1,190)</b>
<b>Industry Total</b>	<b>227,197</b>	<b>22,432</b>	<b>16,826</b>	<b>11,434</b>		<b>288,289</b>	<b>277,240</b>	<b>11,049</b>
One-Month of First Quarter 1963 Report								
Prepared By R & B								

## WHAT MAKES "INSTRUMENTATION CABLE" DIFFERENT?

It is as much the power or control cable that a Trident is like the old family radio. Not knowing the cause can cost a lot of grief: project delays, costly replacements, malfunctions.

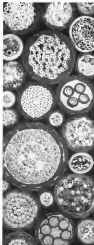
**THE THIN BLACK LINE.** On your schematic, instrumentation cable is a black line from launching pad to blockhouse or from one part of a computer to another. In the broader sense, it connects data or signal sources with display or recording or control devices. Its function is to carry those signals faithfully and with the required reliability. In this day and age, it's no easy job.

**WHAT CAN GO WRONG.** The ingeniously designed cable can simply fail. This has happened and at important sites. An internal short, loose or compound wire can lead to the cable's own destruction. The electrical integrity of this primary insulation. This sort of deterioration would not be sudden, only experts know which components will degrade in a week or a month or more.

On a relative lack of art in instrumentation may create problems for the future. Under certain circumstances it is possible to install the cable in such a way that, in the future, the cable placement, or conductor behavior, will be in the cable layout may create signals or vibrations may be seen in the display, extending or extending point. Your sharp, precise probes become displaced in time, or a little too fuzzy, or are jostled by other unwanted signals from outside the line.

**DESIGN IS HALF THE STORY.** Configuration of conductors within the cable is important, for physical as well as for electrical reasons. For example, positioning of conductors within the cable is critical in order to insure maintenance of minimum standards of conductivity between the inner and outer conductors when the cables are subjected to bending operations during installation work.

Selection of insulating, filler and



packing materials requires expert knowledge and judgment. Some materials, as mentioned above, tend to require. Others become so solid with age or heat. Some change their electrical characteristics in time. There are also fundamentally new problems in cable design, due to instrumentation cable that standards are far more severe than ever before.

**MANUFACTURE IS THE OTHER HALF.** Even a properly designed cable may well become unusable by the time it is in use. This is because of the need for a new manufacturing process. This requires standardization that makes cable construction to a standard low figure and help in the production of standard, and highly precise cabling equipment. It also means, as is so often the case in precision manufacturing, an indefinite life on the part of machine operators.

**ASK THE EXPERTS.** To protect the functioning of your system, there is only one way to make sure the thin black line in your schematic becomes cables with the required dependability: have them designed by experts in consultation with you, and constructed by experts.

Rome-Alcoa is, finally, one of all the very few companies that qualify. We've been designing and constructing these cables since their first conception. If you're going to need instrumentation cable soon, call us, the sooner the better.

We now have a 24-page booklet titled "Instrumentation Cables, Cable Assembly and Handling West." It is a descriptive instrumentation cable applications, production, military specifications and our qualifications. For your copy, write: Rome Cable Division of Alcoa, Dept. 28-61, Rome, N.Y.



First steps on Trident production line find a construction of center fuselage and stub wing section. Barbed adhesive technique is used to bond engines and fuselage to wing and fuselage ribs. Main fuselage joint (right) has titanium bars supporting outward engine pods. Fuselage extends upward to include center engine intake duct, which defines the structure against torsional and bending loads.



## Trident Construction Shown; New Versions Planned

De Havilland Aircraft of Great Britain, builders of the three-jet Trident transport, is actively pushing two new versions to the world market to counter criticism that the aircraft was designed and developed for a single intake, British European Airways, BEA, has 74 of the IC version on order.

BEA presently will operate only Trident on its European routes, but probably will take a batch of the new IC and IF versions to achieve a higher degree of route and operational flexibility.

Trident now is undergoing its flight test program. The fifth piece off the line will incorporate all modifications found necessary during actual flight tests and those planned after No. 1 aircraft was rolled out. Penetration on the current generation of Trident IC is 11,400 lb. Great Britain Airways expects.

The IF and IF versions will be powered by the RB 163-25 Spey, which will have a wet thrust rating of 11,600 lb.

The RB 163-25 has an extra low-pressure compressor stage and research is continuing tests today at Rolls-Royce's Blackpool research facility.

Modifications on the two new versions will include leading edge flap to replace the dropped leading edge on the IC, although the double-chord flap will remain. Wing area will be increased to 91 ft. on both versions, from 89 ft. 10 in., and gross weight has increased from 115,000 lb. to 125,000 lb.

Fuselage on the IF will be stretched from 109 ft. 6 in. on the IC and IF to 117 ft. 5 in., giving a capacity at 20 ft. class and 75 tourist passengers. Range has been increased to more than 2,800 stat. mi.



Three of the first 24 De Havilland Trident IC transport concepts for British European Airways are shown (left) on the production line at Hatfield, England. BEA has an option on another 12 aircraft. Trident wing joint has been replaced with the forward wing joint type (right) due to rough ride caused by the original version. Gear box and track during installation.



# There's a new look to Mark Century Service



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*to the machine-tool builder...*



*to your plant ...*



*for the life of your control*



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**GENERAL  ELECTRIC**

This is Mark Century Service, a totally new kind of service program for the machinebuilding industry that backs up every General Electric Mark Century numerical control system.

Now, General Electric has a special organization of over 750 field-based Mark Century Service Engineers to provide expert service worldwide in the industry. These men are all graduate engineers with factory training and extensive field experience with machine tools and numerical control. This is what Mark Century Service means to you.

You want assurance that the control is thoroughly checked out with the machine tool you buy? We assign specially-trained Mark Century Service Engineers to every major machine tool builder. They know every important detail of

that builder's machines and make sure your General Electric control makes perfectly.

You want startup in your plant handled capably and on time? The man we assign will be an expert on your machine's control combination through experience and specific training at the machine-tool builder's plant.

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If you want a fine control and service to match, specify Mark Century... and get new Mark Century Service. Severely Control Department, Weymouth, Virginia.



## Oceans into ponds

The introduction of the Anglo-French supersonic airliner "Concorde" will reduce the vastness of oceans to the proportions of ponds. Powered by four Bristol Siddeley-Snecma Olympus 500 engines, "Concorde" will easily slip pasterships at LHM high-sea over twice the speed of the fastest airliners flying today.

The Olympus 502 turbojets are being developed and manufactured jointly by Bristol Siddeley and the Société

Nationale d'Etude et de Construction de Moteurs d'Aviation.

One of the world's largest manufacturers of turbo engines, Bristol Siddeley is playing a leading role in aviation development. The company's range of engines power almost every type of modern aircraft, from sailplanes, executive jets and helicopters to transport, fighters, bombers and missiles.

In the central side-of-field, Bristol Siddeley 161/162 turbo engines have been

chosen for the most significant aircraft of tomorrow.

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# Hughes Appeals TWA Default Judgment

New York—United States Court of Appeals has been handed the controversial question of whether the courts, rather than the Civil Aeronautics Board, have jurisdiction in the multi-million dollar litigation between Trans World Airlines and the Hughes Tool Co.

This was a key point cited by Charles C. Davis, attorney for Hughes Tool, in opposing the May 2 judgment rendered by Judge Charles Metzner of the Federal District Court here (AW May 6, p. 41).

Judge Metzner's decision was based primarily on the failure of Edward R. Hughes to appear Feb. 13 for the taking of depositions in the case. This constituted a default by Hughes Tool Co., Judge Metzner held.

The decision did not include a final determination of the damage due TWA, which is suing \$115 million plus cost of interest in the airline. Deeds of the final judgment could give the court of appeals time to consider the jurisdictional question.

Davis had earlier challenged the court's jurisdiction on the basis of the Supreme Court's refusal to decide a writ dispute case involving Pan American World Airways and Pan American Grace Airways (AW Jun. 21, p. 43). The Supreme Court ruled that the CAB had jurisdiction in that suit.

"I am of the opinion that this order involves a controlling question of law as to which there is a substantial ground for difference of opinion," Judge Metzner said of the jurisdiction question. "An immediate appeal from this order is justified, since it may materially advance the ultimate termination of this litigation."

### Questions of Law

Source close to the TWA-Hughes case said that only by addressing it in a higher court could a final determination be attained in anything like a reasonable time. So any question of law here arises in this one of the largest and most cases on record, that it could be settled for years at the district court level, they said.

Judge Metzner charged J. Lee Renshaw, general counsel who drafted the taking of depositions in the case, with scheduling hearings to determine the amount of monetary damages due TWA.

Judge Metzner retained the responsibility of deciding whether Hughes could divert his stock interest in the airline, however. He also ordered dismissal of Hughes' counterclaim, according to over \$100 million, brought against airline TWA executives, based on their

and the airline's loading instructions.

The counterclaim was ordered dismissed "with prejudice," meaning that they cannot be reinstated. Davis has the right to appeal the dismissal, however, although such an appeal is not included in the case he filed concerning the judgment involving TWA.

The Court of Appeals has the choice of determining the jurisdictional question, or sending it back judgment on the damages before considering the case.

Davis, in his appeal, requested that the court proceed without waiting for the damage hearing.

The issue for determining that question [of jurisdiction] is new, rather than after the expenditure in a damage hearing of additional vast sums by Hughes Tool and TWA," Davis said. "Hughes Tool is a subsidiary of TWA, indirectly being 75% of the expense of TWA."

### Events and Reasons

In his appeal application, Davis recounted the events and reasons that led to his client's decision to set on the merits of its position, rather than pursue Hughes by lawsuit.

TWA was suing Hughes Tool on charges that through the 75% controlling interest Hughes was defrauding the airline's equipment procurement program. Hughes followed a practice of buying aircraft from less than 100 firms in TWA. The lawsuit TWA's financial reform, the airline charged.

However, Davis insisted on a more

specific clarification of the record that TWA continued was dragging the primary defense was that Hughes' controlling interest in TWA, as well as its financial position, was irrelevant by the CAB and that, by law, was exempt from anti-trust restrictions.

Davis said that Renshaw consented in October to a success in the taking of depositions and postponed Hughes' appearance until Feb. 13. This Davis said, was to allow time for clarification of TWA's complaint.

### TWA Position

But Judge Metzner, on Jan. 30, ruled to the effect that Hughes' appearance was the essential factor toward the speediest disposition of the case, and that TWA's general allegations of its complaint could not wait 60 days after depositions were taken from Hughes.

Davis said this placed Hughes Tool in the position of either "accepting enormous expense and expending still to avoid business process and appropriate review of documents which a 'believer' witnesses," or of "facing on the merits of the positions which it had heretofore taken."

Davis chose the latter alternative, and Judge Metzner's default judgment followed.

Davis' appeal includes the claim that the default judgment should not have been interpreted as an admission of guilt.

"Prior to the entry of any judgment, whether by default or otherwise, the court must satisfy itself that the plan of his entry is clear upon which relief can be granted," Davis said. "A default, even in failing to appear and answer, does not admit liability or that the complaint states a good case, and checks, Hughes Tool has not, by its entry of position, admitted liability."

Davis also questioned whether TWA had proven anything prior to Judge Metzner's decision.

"The testimony of TWA establishes that its officers cannot directly say conduct by defendants supporting the charge of violation of the antitrust laws entered in the complaint," Davis said. "In fact, such testimony negates the evidence of any conduct by defendants in violation of the antitrust laws."

He said that the CAB approval of Hughes' control of TWA specified that any financial transactions between him and the airline be recorded in property requirements, not to exceed \$10,000 annually or \$1200 per unit in cost. Anything above that had to be approved by the CAB, Davis said, and all the antitrust purchase transactions rendered this appeal.

### Pan Am Freighters

New York—Pan Am's Boeing 707, 720C jet freighters have been ordered by the American World Airways, going that same right each month.

Pan Am's new jet freighters arrive with in first three 1200s on June 17, along two on the North Atlantic and out on transpacific route to Japan. Atlantic flights will be from New York to Frankfurt via London. Pacific flights will link San Francisco, Hawaii, Tokyo and Saigon.

American's involvement in jet freighters approaches \$60 million with the new order. Pan Am will use the American Machine & Foundry developed cargo handling system, called AirPod, on its freighters.

The 90,000-ft. payload freighter can be unloaded and loaded upon water as well.

Pan Am's cargo volume have exceeded 100 million tons since annually since 1965, and growth rate was 22% in 1962. A 25% rise is forecast for 1963.

## AIRLINE OBSERVER

World domestic and international airlines reported a 12.9% increase in traffic during 1982 compared with 1981, according to International Civil Aviation Organization (ICAO) preliminary statistics for 1982 indicate that member airlines will report an overall operating profit of \$68 million, compared with an operating loss of \$1.15 billion in 1981. Average passenger load factor for the world's scheduled airlines was 53.4%, the third consecutive annual decline from the high of 60% recorded in 1979. ICAO also reported that at the end of 1982, airlines operated 5,107 aircraft, of which 765 were turbojet and 972 turboprop. The Douglas DC-3 accounted for almost 25% of the total fleet. The year 1982 was the safest on record for the airlines: passenger fatality rate was 0.55 fatalities per million passengers.

Continuity rate of International Air Transport Association (IATA) membership will come under close scrutiny in a re-examination of IATA's membership membership, which is now conducted by audit observers as an inevitable result of the transatlantic law debate (AWM May 27, p. 34). Unanimity rule, or a power of veto in traffic conference votes on tariff resolutions, is blamed by some officials for the lag in lowering of rates and fares.

Russian airlines continue to seek for its An-24 turboprop transport. Initial sales pitch by the Soviet aviation export monopoly, "Aerospets," is that the An-24 "is the latest in aviation technique, is designed for use in different climates, is adaptable for short and medium range flights, requires no special airfields, has a high payload rate and is simple to service and operate."

British Ministry of Aviation is cracking down on overnight transport pilots to reduce the risk of heart attacks while airborne. Targets in the 40-year-old-plus pilot. Some have already been grounded with their sleep deprivation. New regulations, coming into full force next September, also will demand that all pilots of International Civil Aviation Organization member have periodic cardiograph tests.

Jet Airways Service, newly-organized Jet Airways, began scheduled domestic scheduled service last week with Bombay-Bombay service. The carrier, a wholly owned subsidiary of British West Indian Airways, is operating three round trip daily between Mumbai and Bangalore, with two of the flights serving intermediate points of Ocho Rios and Port Antonio.

First and only scheduled airline to establish a service routes at Cape Canaveral, Fla., doing a Mexico flight was National Airlines. Carrier set up a centrally located unit for MIA-9 and the long-awaited service was fully utilized with requests for reservations and flight information.

United Air Lines President W. A. Farnsworth has charged that it is unrealistic to expect an increase in the level of bus rates. "The carriers are attempting to reduce seat mile costs by adding more seats in hopes of becoming competitive with cheaper forms of transportation. I place this in the same category as charging in airlines..." he said.

Aeroflot will sell airline tickets at all Moscow railroad stations, main hotels and a number of independent travel agencies. In another move to make air travel more convenient, the Russian carrier said that "airfare fares" in many tickets will be purchased by telephone from now on even before. These tickets will be delivered to the purchaser's home or office.

Trans-International Airlines is first carrier to provide jet cargo service for Military Air Transport Service under MATS new policy of contract airlines toward cargo airlines with jet equipment. On its second MATS flight, TIA here last month set a new MATS operational payload record by loading an 87,828 lb payload load from Tokyo AFB to Saigon, South Vietnam, in a Douglas DC-8F cargo transport.

## SHORTLINES

Aeroflot will operate up to 40 flights daily from Moscow to ports in the Crimea and Caucasus this summer. Service will include a record 12-13 teletype transport flights daily from Moscow to Adler in the Crimean Black Sea coast.

Akiba Airlines has opened a Tokyo tourist office at the Osaka of the Imperial Hotel.

Boeing Airlines has been awarded a presidential "E" award by the White House for its promotion of "Visit USA" sales in Latin America.

Elhaggar Airlines has added Boeing 718B turboprop service to its route between Addis Ababa and Addis Ababa-Khartoum and Lagos.

Federal Aviation Agency survey indicates that approximately 30,000 certificated aircraft maintenance personnel are now employed in the U.S. Total includes 18,000 with the airlines, 44,000 in general aviation and 6,000 with manufacturers and the government.

National Airlines says revenue increased 27% in the first three quarters of its fiscal year ending June 30, compared with the same period last year. Cargo ton miles rose 21% in the same period.

Pan American World Airways completed its 7,000th round-the-world flight last week. Carrier now operates two such flights daily. Service was inaugurated in 1947.

Trans World Airlines has reported a 45% increase in advance bookings on scheduled transatlantic flights for July, compared with the same month last year. Worldwide bookings have increased 28% for the same period.

United Air Lines has proposed a fleet top size 30% less than standard for school children, 12 through 21 years of age, traveling in groups of 15 or more between Chicago and Detroit. Civil Aeronautics Board has ordered an investigation.

U.S. Chamber of Commerce is supporting legislation that will give the Civil Aeronautics Board power to suspend service on international operations, but oppose Board authority to fix international rates.



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# AERONAUTICAL ENGINEERING



**DISMAY** T-47, one possible aircraft configuration for use in counterinsurgency warfare, was modified by the Air Force Special Air Warfare Center, Eglin AFB, Fla. Aircraft have a small tail boom, but could carry supplies on the same point.

## Air Force Expands Air Commando Forces

By Larry Woods

Eglin AFB, Fla.—A first glance at USAF Air Commando is hard to distinguish from an Army infantry unit. The commando's gross field activities, devoted to those wars by the Army, symbolize Air Force's accelerated effort to develop equipment and train men for counterinsurgency warfare operations in conjunction with the Army's Special Forces.

Gen. Curtis E. LeMay, chief of staff, established the Special Air Warfare Center here, under the tactical Air Command, on Aug. 25, 1961, when it was apparent that the Army, through its Tactical Mobility Requirements Board headed by Lt. Gen. Himmelfarb, would try to assign its own assets to the Special Forces. The action was also catalyzed by increasing emphasis on broadening the U.S. capability to aid friendly governments in civil wars (see below).

Consequently, Brig. Gen. Gilbert S. Fitzhugh, the center commander, has led a great light on speeding training to increase the use of the center's First Air Commando Group, and has been increasing top priority in modifying what were considered classical aircraft and developing special equipment for use with them.

Whenever the First Combat Applications Group, located at the main base here, sends a jet down in a hurry, the term "First Com" preceding a dispatch or letter guarantees quick action. One "First Com" operation was the cash program for modification of more than 200 North American single-engine, two-seat T-28 trainers to a close troop support configuration at the expense's

Columbia plant between May and August of last year.

Most of these aircraft are now in service in South Vietnam, flown largely by South Vietnamese pilots. These pilots were taught to fly and maintain the aircraft and its equipment, and trained in close-support tactics, by Air Commando.

Work of the Special Air Warfare Center is a variety of field test operations in varied locations, conducted in some instances with actual combat conditions. The commando group maintains three detachments in widely scattered locations.

Headquarters of the center was the 440th Civil Training Squadron which was formed here in October, 1961, as the Air Force became aware of the Kennedy Administration's emphasis on the need to prepare for non-nuclear warfare. The squadron established an advanced training base of two detachments north of the city of Hanoi in the Republic of Viet Nam, located in the western edge of North Vietnam. Detachment 2 was sent to South Vietnam when the situation there worsened.

When the center was established, the First Air Commando Group and the First Combat Applications Group were formed from the former 440th Civil Training Squadron. Detachment 3 was formed and now operates at Albrook AFB, Canal Zone (AWW May 13, p. 17).

At present, 2,100 personnel are attached to the center, most of them in the field. About 10 men are attached to the headquarters staff and training detachments of the Air Commando Group, and the Combat Applications Group consists for another 90. Support

personnel belonging to support squadrons and the Air Force Systems Command total 900.

When the center was formed, it had only 500 personnel. In 1961, a request for an additional 5,500 men was dropped, but modest increases since then have brought the center to its present strength.

The Combat Applications Group, commanded by Col. Benjamin H. King, who also commanded the predecessor 440th Civil Training Squadron, has been responsible for development of new equipment and modification of existing aircraft and equipment.

Widespread use of pods for carrying a variety of payloads is the group's general emphasis. The pods can be hung on standard bomb racks installed on T-28, Douglas C-33, T-44, and Fairchild C-119 aircraft. It stores gas chemical dispensers, rockets and electronic equipment.

Use of pods to counterinsurgency warfare provides flexibility in the type of mission that can be performed by one type of aircraft. In addition, they permit rapid change whenever a package needs replacement. Forward assets can keep a supply of spare assets for use while others are moving to the scene for repair.

These are some of the packages that are being put into pods.

• **Mopups.** These Calliguly-type, 7-60 hp mopups are low velocity, barrel and can fire 6,000 rounds per min. Weight capacity is 1,500 pounds. Pods also carry 30 and 70 all machine guns. Weight capacity for these low velocity has increased from 500 to 300 pounds.

• **Autonomous radio relay pod.** The RQ-2



**AIR FORCE/NORTH AMERICAN T-28** (right corner) is variety of aircraft when converted to counterinsurgency work. Above left, aircraft is equipped with a multiple bomb rack developed in response to an Air Force requirement. Rack can carry a variety of bombs and their ejection and also can be used as R-25 aircraft. Above right, 30 all machine gun pod is shown with access doors removed. Below, T-28 carries an eight-tube 2.75-in. rocket launcher and machine gun pod under wing.



at the AN/ARC-67, when carried to 13,000 ft. altitude by its aircraft would permit two ground RQ-2 portable stations to contact each other up to 200 mi.

• **Counter and infrared sensing pod.** Development is under way on a low-light-level detection package using the Army's low-light-level television sensor. Reconnaissance color is not used because its use is of little value in jungle areas.

• **Duplex navigation pod.** This package is made up of a short range radio, the AS-4300/APN-15700 antenna assembly, an AN/ASN-25 Amplifier, Computer and the RT-55/APN-11300 microtransmitter receiver.

• **Rocket launcher.** This pod can fire 2.75-in. rockets.

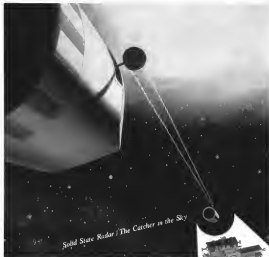
• **P-2 dispenser.** This carries 90 World War 2 and Korea war type grenades of the white phosphorus, low gas or white smoke variety.

• **Jet pods.** These three superpropulsion pods can be hung under the wings of C-123 aircraft to aid in taking off from short strips.

All Air Commando aircraft are being

**SPECIAL AIR WARFARE** rocket pods on T-28 counterinsurgency aircraft are loaded during operations in South Vietnam. Navy X-45 aircraft also is being used and has been found very flexible.





A new solid state radar system built by STL engineers and scientists can send out and receive signals at X-band frequencies to help man rendezvous and dock vehicles in space. STELATRAC is its name. It is the first solid state system of its kind. The X-band transmitter is shown above. It has successfully passed temperature and vibration tests. STELATRAC can also be used as a command link between vehicles in flight. By altering its module design, the flexible radar system operates as an altimeter and doppler velocity sensor to guide spacecraft safely to the surface of the moon and planets. Today STL is busy on many such projects to STELATRAC. STL is also prime contractor for NASA's OGC and a new series of classified spacecraft for Air Force-ANPA. And STL continues System Management for the

Air Force's Atlas, Titan and Minuteman programs. These activities create immediate openings in Theoretical Physics • Systems Engineering • Radar Systems • Experimental Physics • Applied Mathematics • Space Communications • Ammunition and Munitions • Jetted Guidance • Avionics Components • Solid State Physics • Computer Design • Telecommunications • Space Physics • Digital Computers • Guidance & Navigation • Electromechanical Devices • Engineering Mechanics • Aerodynamics • Propulsion Systems. For Southern California or Cape Canaveral positions, write Dr. R. C. Potter, Department A-6, One Space Park, Redlands Beach, California, or Box 4373, Patrick AFB, Florida. Your inquiry will receive a prompt reply. STL is an equal opportunity employer.



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**MODIFICATIONS OF AIRCRAFT** to make them usable in counter-battery warfare were developed by the Counter Applications Group under the Special Air Warfare Center at Ft. Rye. Above are the Illinois U-19, the North American T-28, the Douglas B-19, the Douglas C-47, Carver C-46 and the Fairchild C-123.

equipped with ARG-44 VHF frequency modulators taken completely with the Army ground equipment. One problem during joint Air Force Navy operations had been the difference in radio equipment with Air Force using single-beam modulators and the Army using TM.

Other equipment and techniques have emerged from field experience. One example is the psychological warfare technique in which airborne loud speakers are used to tell to people on the ground. The first "Voice Gate" (voice gate for the South Vietnam project) aircraft was in Southern Asia.

was equipped with loudspeakers which were developed for the job. C-47s are now developed a lightweight unit that can be installed in any aircraft with a side door, such as the U-19 or Douglas C-47. The unit can be converted to use more speakers and amplifiers. Installations in both types of aircraft can be heard directly on the ground.

C-47s have considerable work with pickup and delivery of cargo with just dropping in aircraft. All American Engineering has developed a system whereby cargo can be extracted from moving aircraft on pallets by engaging an arriving war vehicle by a hook attached to the pallet (AW Syst. 34, p. 132). Southerly packages can be picked up by aircraft flying overhead and an-

gaging a heap with a hook. A nylon line shows the track.

An unusual technique of pickup and delivery is practiced by U-19 pilots. The pilot makes a tight turn after making a pass over a clearing and lowering a nylon line into a clearing. Personnel on the ground hold the line while the plane is being made and attach it to the package to be picked up. The pilot then flies out and chutes away, taking the cargo with him, then watches it over the cable. A reverse process would be used for delivery, but the operation is more difficult.

U-19 aircraft are also fitted with cargo ramps and roller tracks in the cabin so that cargo can be handled easily. These short takeoff and landing aircraft have a range of up to 1,400 miles at a speed of 100 kts. Most weapons are relatively short and the heavy guidance load can be replaced by other payload.

New, improved parachute flares have been developed to aid in night operations. They were tested in South Vietnam.

One problem in jungle and mountainous areas is how to direct troops to targets after they are loaded. Southerly vehicles and tanks provide a base and for many years, but are gradually being replaced. C-47s are evaluating balloons, lights, radio beacons, day and

improved smoke rockets. Load conditions dictate which type would be used for greatest effect.

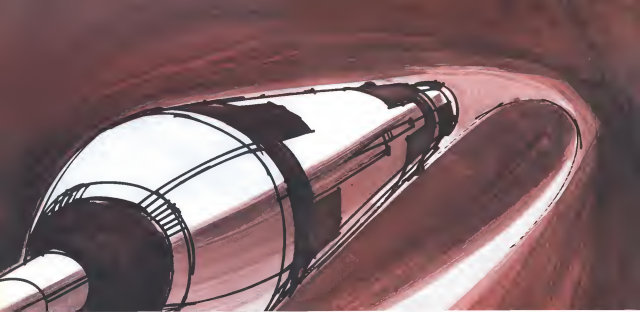
The T-28, as a trainer, had a baggage compartment which has been modified as a mine carrier to house a mountain mine carrier. The carrier can shoot vertically and sideways, and can operate at night, using flash bombs. Others are being modified as U-19 aircraft.

The New Zero rocket, which is more versatile than the T-28 in rockets has been tested by C-47. It can carry a variety of payloads such as submunitions with a powerful force with personnel with a considerable impact force, adding destructive effects against ground targets with delay fuses, and others for target marking, smoke and obscuring.

The LAD-1000, however, can fire Zeros again, in fact at a time.

Experience in South Vietnam and elsewhere has shown that the T-28, B-19 and C-123 need modifications to make them a more effective. That is the modification effort under way or planned.

• T-28. This aircraft has been modified into the YAG-59E by replacing Whittaker D-1142 hp propeller engine with the 2,400 hp Lycoming T55 turboprop. Wings and empennage were strengthened and had carrying capacity increased. Additional fuel cells



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were added inside the fuselage, and use of external tanks made optional. Two machine guns were flush mounted in the wing.

The last YAT-28E crashed recently during a test flight (AW Apr. 1, p. 10). Two more T-28s are being modified to the YAT-28E configuration at North American's Cokeron, Ohio, plant.

• B-26. Those in the inventory were overhauled between 1946 and 1944. According to Col. King, they are "a lot better, and are poorly equipped by today's standards, but they are still able to do an excellent job unless their cargo and other capabilities are needed."

B-26 modifications now under way include replacement of the 2,000 hp Pratt & Whitney R2800-57 engine with K1500-94W engines, rated at 2,500 hp each. JATO boosters will be added to aid further in short field takeoffs. Removable-grab propellers are being added, and the wheels will be of the Boeing KC-115 jet trailer type, providing additional lift on the airfield or wet runways. Addition of wing tip fuel tanks will increase range and reduce the stall speed by 9 kt, because they act as fences on the wings to prevent stall vortices.

The redesigned B-26 cockpit now has a modern flight and engineering instrument panel and an instrument panel adapted to control of a variety of payloads. A larger rudder will provide positive control at lower speeds with single-engine operation. Automatic propeller feathering has been provided, so that in the event of engine failure the pilot can concentrate on flying the aircraft without having to divert his attention to performing the feathering sequence.

Landing gear in the modified B-26 is retract in 12 sec instead of 22 sec. An electric composite hydraulic pump has been installed and improved wind-throw doors will work efficiently in tropical climates. Modern photorecognition cameras have been installed. In four main-bay, the aircraft's aerial case can be removed and a glass one installed, or vice versa.

#### Antipodet installation

Six 10-in. machine guns are installed in the wings. The guns can be accommodated a photograph or a bomb. An E-4 antipodet will put accurate tracking for photographs. The photograph will be able to control the aircraft from his own station through the E-4. A ground-based deflector will also make photographs more accurate and will aid in dual airborne deflection. The deflector is a part of a Novalon lightweight that will be used for level bombing.

Further B-26 improvements include cockpit heating for cold weather and

cooling for tropical operations, anti-icing for wing and tail surfaces and windshield, an oxygen system for high altitude operations, fuel controls with pressure for holding the right-hand control column and pedals out of the way and modern radio whose controls are in the middle of the instrument panel.

• C-123. A modification program for the C-123 type aircraft will begin soon. It was found in South Vietnam that the wheels were not large enough to operate in some road conditions. Larger wheels and tires will be substituted. Runway layer needed for the wings is being anticipated and under-wing jet engine pods are being tested in the TC-123H version.

• Dumbo A-1E. The CAG evaluated the capabilities of the Navy-Marine attack aircraft and found that its load-carrying ability, combined with a two-man cockpit, made it an ideal vehicle for counterinsurgency use. About 198 aircraft from various Navy inventories will be overhauled and slightly modified. Two squadrons will join the first Air Commando Group this year.

#### Utility A-1E

In some versions the A-1E can carry about 5,000 lb of external ordnance. It has four 18 mm cannons. As a utility aircraft, modified to carry passengers to and from aircraft carriers, it will be possible to carry 2,000 lb of cargo, 12 passengers or eight fully equipped paratroopers. On the paratrooper mission it could operate during the 15-min ascent and ejection plus 5,000 lb of external ordnance or fuel. Powerplant is the Wright R3350-170001.

The First Air Commando Group has its headquarters at Hurlbert Field, also known as Field No. 3, just off the Eglin complex. It is commanded by Col. Gerald J. Ott, who recently relieved Col. Chester A. Jack. Units of the group are the South Fighter Squadron, the 18th Troop Carrier Squadron and the First Air Materiel Squadron.

When additional personnel and equipment are authorized, Gen. Pritchard will form a second group.

At present, Air Commando training includes tactics for day and night operations on different types of terrain, with emphasis on jungle and mountains. Every six weeks a class graduates from the Hurlbert course and the men are then transferred to one of the three detachments. Each Air Commando must have a working knowledge of a language other than English.

The training course emphasizes aircraft and equipment maintenance in the field, loading of indigenous personnel, operations from strange rough landing strips, low-level navigation and operations in bad weather. In various

delivery, the types studied are napalm, rockets, machine gun strafing and aerial loads of bombing.

Methods employed by Air Commandos in conducting guerrilla type maneuvers were demonstrated here recently to visiting Air Force chiefs-of-staff from more than a dozen Latin American countries.

#### Night Missions

The victory, accompanied by Gen. Walter C. Swenson, TAC commander, were landed after dark into two C-123 transporters and flown to a dirt strip on the Eglin reservation. The flights were made without running lights and the landings were made without landing lights.

The group, based in Spanish, Portuguese and French, watched a 1 lb version of a typical three-month counterinsurgency operation. The demonstration illustrated three events.

A UH-1H first over a predetermined location, picked after reconnaissance, and drops a commando or trained native by parachute. Then, carrying a radio, makes arrangements with friendly natives for them to accept help. If necessary, he is aided by rocket drops and airborne loudspeaker propaganda. Loudspeakers dropped at night can make visible by applying phosphorescent paint to their edges.

When sufficient progress has been made, a C-47, guided by radio and flashlight, flies over and drops five to 10 paratroopers carrying mechanics and equipment to prepare for eventual encirclement of guerrilla activity.

The final buildup of strength occurs when C-123 aircraft bring in whatever number of troops are needed for the operation. In the demonstration, ten aircraft-loads of men were flown in. The type of paratrooper and in night landings descended slowly enough for the men to keep their feet where they land.

After the troops are surrounded and captured, weapons and supplies are dropped from C-123, C-47 and C-46 aircraft, completing the strength buildup phase.

Then action begins. A target that needs softening is gunned down. C-10, T-18, B-26, C-47 or C-46 aircraft drop bombs to illuminate the target.

In the demonstration, T-28s attacked a target on the opposite side of the strip with napalm, 100-lb bombs and machine guns. B-26s dropped bombs and fired 7.68-in. rockets.

After the target area is softened, the troops attack.

Air Commando and Special Forces are in close contact of each other for the purpose of training local forces. But if they must, they go along on missions and shoot if they have to. Therefore, there have been casualties.



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**SWITCHES AND**  
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It's because Cutler-Hammer recognizes that reliability must be designed in and built in — not merely tested for after the device is produced. That's why we maintain a Class II room for contamination-free assembly of relays. That's why we set our own exacting specifications for every device, and carry out a full program of in-process inspection and testing. And there are our numerous design patents. That's why — whether it's a switch, contact breaker, or Class II or hermetically sealed power relay — you're assured of unmatched reliability with Cutler-Hammer.

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Need a special switch or power relay to solve your problem? For really fast service, call your nearby Cutler-Hammer sales office. There's one in every major city. And for detailed information on our complete line, write for a new 40-page catalog, publication LAI-658.

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Garrett-AiResearch

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- All parts to support our many product lines are made by Garrett-AiResearch under the same high quality control conditions as in the original manufacturer.
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- Four factory and test facilities available at each of our manufacturing centers—TAA approved.
- 90 day warranty after first use, or 100 day warranty after delivery.
- Analytical engineering programs provide product improvements to extend time between overhaul and reduce operating costs.
- Experience—a quarter century in overhaul product lines.

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- Lower cost because of established factory outside, high volume, and intimate technical knowledge of our own products.
- Established price lists that enable you to estimate future costs accurately.

### SERVICE

- Ten day turn around on all equipment.
- Unit exchange programs for gas turbines and other Garrett-AiResearch equipment on certain corporate contracts.
- 100 field service engineers on immediate call throughout the world.
- Backed up by total support program: repairs, inventory, technical publications, training programs, etc.

Please direct your inquiries to Support Services at any of the divisions listed below.

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Vertol Shows Aerial Loading, Unloading

Vertol 307 hoists 4,500 lb. loads from the ramp to demonstrate portability of loading and unloading aerial hoist units while hovering. Hoisting both the technique is particularly suitable for emergency situations, including space hardware, from water and unloading cargo to people and construction sites.

## PRODUCTION BRIEFING

Canair Air Conditioning Co. has a \$15.4-million Air Force contract for environmental control systems in Minuteman missile sites and control centers. Systems will be installed at Minuteman sites at Meigs AFB, N.D. and White Sands AFB, N.M.

Whitlock Corp. has a NASA contract for development of a personal linguistic system for Project Gemini. System will provide for sign cloning, oral hygiene and shaving for 14-day orbital missions. Work will be done at the company's research laboratories in St. Joseph, Mo.

Emerson Electric Mfg. Co. of St. Louis, Mo., has formed a Flight Systems Dept. for development and production of radar and rocket subsystems, aircraft electronic systems and

aircraft vehicular structures. Department will operate within the firm's Electronics and Space Div.

Radco Electronics Corp., Costa Mesa, Calif., has a \$2.1-million contract from the Bureau of Naval Weapons for improved and control equipment for remote control of helicopters and missile target simulators.

Goodyear Aircraft Corp. will change its name to Goodyear Aerospace Corp. effective July 1. The firm had had its present name since 1959 when it changed its name from Goodyear-Zeppelin Corp.

Bendix Corp. has a \$23-million Navy contract for continued production of the Talos missile.

Martin Co.'s Orlando Div., has

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## PUMP PRIMERS

ARTHUR A. NICHOLS

### How One Pump Can Serve Several Systems

■ Six-year-old pumps have been strengthened by Corvair pumps which permit the incorporation of an extra pumping element in a separate cluster of the labor-saving pump to provide fluid pressure for a control function as well as for use.

■ The Corvair is a form of internal gear pump consisting of only two moving parts: an inner toothed element and an outer, matching toothed element. The inner element has nine teeth, while the outer has the "mating teeth" which provide a chamber to move the fluid from the inlet port to the outlet. Pump capacity is increased by the addition of the "mating teeth" multiplied by the number of drive teeth and RPM (Fig. 1).



■ The unique construction of the Corvair type pump permits aircraft systems designers to combine several pumping functions in a single pump housing mounted on a single port and driven by a single shaft. Diversified systems such as lubrication, engine oil, low pressure hydraulic servo systems and engine oil to pressure of wheel, 3000 psi may be combined in this master (Fig. 2).



■ The designer has several variations in pump capacity within his pump. Modifications: Corvair diversity which governs the use of the pump; Corvair diversity which governs the use of the pump; Corvair diversity which governs the use of the pump; Corvair diversity which governs the use of the pump.

■ The Corvair pump is a positive displacement type, following a pre-designed standard. It is simple and compact in design. It is lightweight, vibration-free, provides exceptional performance at high altitudes and has low wear over a long service life. In addition, it is lubricated and extremely quiet in operation.

■ Detailed data is available and your inquiry is invited. Write:  
**W. H. NICHOLS CO.**  
Makers of Zerol Motorway Pumps  
and the Zerol Milling Pump  
"The roller that won't let you rest!"  
40 WOOD AVE., WALTHAM 54, MASS.



### 727 Ready for Flight-load Tests

Third production Boeing 727 is hoisted in a standard steel support framework in preparation for a flight-load series to begin this month. Preparations include calibration of over 600 strain gauges installed throughout the aircraft. This will be used to confirm estimated design loads and structural strength.

hoisted ground on a new 127,500 sq. ft., 52-million research center at Orlando, Fla.

Federal Electric Corp., an associate of International Telephone and Telegraph Corp., has been awarded a \$16.5 million Air Force contract for the operation and maintenance of the Detroit Early Warning (DEW) System during Fiscal 1964.

Anco Corp.'s Aerospace and Electronic Div. has opened a joint office moving and development center in Huntsville, Ala.

Western Electric Co. has been awarded a \$15.5 million Army contract funding continued development of an advanced radar designed for the Nike X anti-missile system.

National Aeronautics and Space Administration has awarded International Business Machines Corp. a 14-month contract to experiment with an automatic landing system to alert its aerospace scientists and engineers to technical information involving their aircraft. Engineers and scientists would indicate an area of interest and a computerized system would indicate reading material pertinent to their query.

Low Single, Inc. has a 51-million Army contract for production of a series for the Sequoyia outposts.

surface missile. Work will be done at the Segley Power Equipment Div. in Cleveland, Ohio.

Radio Corp. of America's Avionics Division has won a \$117,000 contract to study various methods for the synchronous radio-located satellite, and Hughes Aircraft Co. received a \$60,000 award to study ways to modify the Syncom communication satellite to carry another antenna.

Sunny Phosphate Co. is investing about \$1 million in a 10% plant expansion for about 500 additional personnel needed to design new engineering and production programs. Projects range from improved control and guidance instruments for the Air Force X-30 (Dyna Soar) space glider to autopilot and guidance instruments for modern aircraft.

NASA deep space tracking station at Tidbinbulla, Australia, near Canberra, will be operated by a consortium of the Australian subsidiaries of the Hawker Siddeley Group, Eldec Automation and Associated Electrical Industries.

Expanding Div. of Anco Corp. placed purchase orders totaling \$63,500,000 during the 1962 calendar year, the company has reported. A total of 2,471 airplanes made sales to Lyndon B. Johnson's administration in the New England area.



### We've got 4,500 pounds by the tail

Picking up a load and lowering it whole — without having to touch down — will be a major feat for a helicopter. This new technique of dual rotors — one for lifting and one for lowering — will add important new capabilities to the already impressive versatility of the Boeing Vertol 107. The ability to lift a 4,500 pound load in this manner is due at the many advantages of the tandem rotor configuration. Helicopters have an impressive new range

of operating flexibility when they're freed from landing-site loading. They can pick up heavy objects such as radio equipment, and perform for personnel and supplies in any kind of terrain — jungle, marshy or mountainous. They can deliver critical space hardware from the water. They can change pick-up or drop sites on call. And even having made a pickup, they can put the load and payload inside the cabin where it belongs... and proceed at rated speed.

The Boeing Vertol 107 is another example of creative engineering, forward thinking, versatile system management and the vital resources of the Boeing Company.





## How much will one USAF StarLifter lift?

154 troops or 137 paratroopers.

This is a typical example of how the new C-141 StarLifter will give MAIS the airlift power to increase the Army's air mobility.

The StarLifter will also carry many combinations of men and machines, including outsize vehicles that could never be airlifted by jet before.

The C-141's truck-bed height or drive-on ramp rear-loading design permits immediate access to

the 7,000 cubic foot clear cube cargo area. For palletized cargo, the C-141 will use the new 463L mechanized loading system. In a matter of minutes, the big turbofan airlifter can be loaded and be on its way to a destination anywhere on earth.

Progress report: The first C-141 StarLifter will fly this December.

### Lockheed C-141 StarLifter

LOCKHEED-GEORGIA COMPANY  
Marietta, Georgia — a division of Lockheed Aircraft Corporation







**PROVEN ON MERCURY CHOSEN FOR GEMINI**

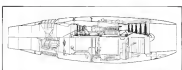
The same operational precision... the same pathologic accuracy in ACT1200 is expected when you use Raytheon Switch Corporation's Gemini 2 man computer logic.

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**ROLLS-ROYCE SPEY-25** bypass engine, to be used on the BE and HF variants of the de Havilland Trident transport, has thrust about 21,000 lb.

## Spey-25 Bypass Turbojet Engine Has Additional Compressor Stage

London—Rolls-Royce Spey 25, now being developed with government support, has been revealed as basically the same as the Spey 2 except for one additional stage at the rear of the existing four-stage low pressure compressor plus turbine modifications for improved efficiency. Thrust is increased 10% for a takeoff rating of 11,400 lb.

Spey-25 is a bypass turbojet with a maximum basic dry weight of 2,112 lb. and an intake face diameter of 32.4 in. High pressure compressor is a 12-stage axial flow unit. Gross fuel consumption at 20,000 ft. and 505 mph true air speed is 0.79 lb./hp./hr.

The Spey 25 offers considerable economy advantages, such as the turbine wheel/compressor system with single fuel nozzle. Fuel manifold is mounted outside the bypass duct, as on the Conquest.

To avoid severe amplification of small speed forces, the Spey fuel control system uses control forces acting directly on large rotating elements which handle the main fuel flow. Fuel bearing assembly provides damping effect.

The thrust system is designed and stressed for reflight use and has been tested in three regions on the de Havilland Trident. Object ducts of the engine are fitted with cowls which prevent hot gas ingestion or ingestion of stones thrown up from the runway.

The compressor and first stage high pressure turbine blades are of the same material as the latest Conquest blades, but have higher cooling standards and substantially lower stress. Conquest blades have run 9.9 million cycles hours without a fatigue failure.

Rolls has conducted tests with air craft engine test, simulating 90 deg. compressed conditions and engine and the Spey has operated satisfactorily. The company is also using a simulated aircraft fuselage to obtain suitable effects of air flow patterns in the intake.

Other features detailed by Rolls: • Mainshaft loading of low and high speed compressor blades to ensure engine working conditions well away from a compressor stall.

• Inlet guide vanes are so angled to reduce stress attributable to differential expansion.

• Compressor blade tip speeds are maintained to reduce intake noise and to prevent high air flow with a maximum fan tip area, without incurring high heated shock losses on the first compressor blades.

• Large seal clearance between rotor and stator to minimize damage due to block debris on during entry of birds or other foreign objects.

• Low pressure compressor air is fed to all rotor shaft bearings to extend seal bearings, low oil temperature and oil consumption and reduce icing taking.

Oil is not changed during the life of the engine.

Although design advances produce the 10% increase, Rolls is holding initial thrust rating to 4% above the Spey-2 to achieve same speed loading of overall life.

Predicted time-between-overhaul is 2,600 hr by mid-1966.

## GAO Says Air Force Overstated Plug Needs

Washington—Air Force overstated its Fiscal 1965 requirement for platinum electrode spark plugs by about \$4.6 million because it failed to use plug plugs already on hand, according to a recent General Accounting Office report to Congress.

GAO had already bought \$1.6 million against that requirement. GAO and procurement of the remaining \$3 million worth has been indefinitely postponed.

"Our review disclosed that some activities were not obtaining the ap-

propriate device life from platinum electrode spark plugs and that relatively unused spark plugs were being returned to the Air National Guard for reuse or scrap disposal," GAO said.

GAO also charged that USAF was using platinum electrode spark plugs costing up to \$4 each for buying when mature electrode spark plugs costing only about \$1.25 each would have served the purpose.

Those other GAO reports to Congress charged overpaying for defense contracts.

These were: • Westinghouse Electric Corp. Air Force paid \$404,500 in "unmerited credits" on a prime contract with Boeing Co. for Boeing turbine because it included inflated costs on a subcontract with Westinghouse according to GAO's report.

Westinghouse supplied Boeing turbine inspection systems. The prime contract with Boeing was negotiated in 1959.

GAO stated: "The subcontractor quoted a price to the prime contractor based on cost estimates that were higher than those published by its most recent cost experience; the prime contractor, without adequately verifying the price, included it in its proposed initial estimate of the price to the Air Force; the Air Force not only accepted the price but also accepted the subcontractor's proposed price without adequate review; but the Air Force did not attempt to verify the price to be based on this price."

• Hughes Aircraft Co. H-100000 by "unmerited credits" of \$414,000 by overpaying subcontractors with General Aircraft Engineering Co. for spare parts and modifications for its aircraft main system, according to GAO.

Contracts awarded these purchase orders for the parts, totaling over \$1 million, on a non-competitive basis in 1958 and 1959.

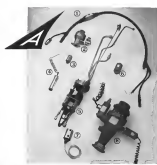
The General Accounting Office was with Navy Dept.

GAO commented that "we found no evidence to indicate that the Navy questioned the prices quoted open by General Aircraft Engineering Co."

• General Aircraft Engineering Co. GAO and Boeing Co. paid the Army \$515,000 in three contracts for spare electronic parts.

The contracts were awarded in 1959 and 1960.

GAO said: "Borroughs proposed prices that were higher than those published by its most recent experience cost data, and the U. S. Army procurement officer, Ft. George G. Meade, Md., accepted Borroughs' proposed price over estimates without adequate review."



## CAPABILITY—RELIABILITY... an Aerotec Tradition

Whether the application is for aircraft, missile, ground support or land and sea defense, Aerotec supplies the most important ingredients... capability and reliability. Inherent with Aerotec is the ability to conceive, design and develop a component to difficult requirements, and complementing this are manufacturing techniques assuring production of equipment that will operate reliably under severe service conditions.

New concepts of flow indicators, pressure switches, valves, level indicators and disconnects are constantly being produced at Aerotec. A call to 200 JT 1-5400 will bring a prompt response. Or write: Aerotec Equipment Division, Aerotec Industries, Inc., Dept. A.W., Greenwich, Connecticut, for help with your system or component problems.

Illustrated and listed below are a few of the Aerotec designs developed to specific customer requirements.

1. High-pressure and temperature gas flow indicator designed for much greater accuracy than standard.
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8. High-pressure and temperature gas flow indicator designed for much greater accuracy than standard.
9. High-pressure and temperature gas flow indicator designed for much greater accuracy than standard.
10. High-pressure and temperature gas flow indicator designed for much greater accuracy than standard.

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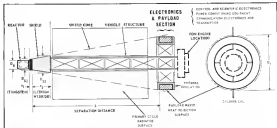
## New Raytheon System Uniquely Combines Air-to-Ground, Air-to-Air Radar Functions

Raytheon's offensive system for advanced tactical aircraft is the first to provide a unique combination of precise terrain avoidance and ground mapping with air intercept radar functions. The system includes a proven air-to-air missile with all-weather, all-altitude and all-aspect capability.

The ability to conceive and design the system in an outgrowth of Raytheon's progressive and continuing effort in airborne radar and missile technology.

Related experience includes design and production of the bomb/nav search and terrain avoidance radar for the B-52, the bomb/nav radar for the B-58, management of SPARROW III and HAWK weapon systems, plus detailed study and analysis of mission requirements for advanced attack aircraft.

For additional information, contact Missile Systems Division, Raytheon Company, Bedford, Mass.



BENDIX design for shielding weapons control and payload in nuclear-powered spacecraft uses both physical separation and shield.

## Spacecraft Radiation May Boost Tube Use

By Philip J. Klass

Dayton-Idaho radiation entries were placed in a nuclear-powered spacecraft coupled with the radiation vulnerability of semiconductor devices, may boost the use of vacuum tubes in such vehicles.

Data showing the crossover point in weight saving between semiconductor and tubes was reported by James J. Edmond, Radar Research Laboratory, during the recent National Aerospace Electronics Conference here.

Bendix study considered the weight of the avionics payload aboard a nuclear-powered spacecraft, the weight of shielding required to protect it and the fraction of the weight of the nuclear-generated power required to operate the payload.

On the basis, Bendix found that in a spacecraft powered by a 3-kw (tube-type) SNAP-2 reactor, the use of semiconductor devices often a net weight saving only if the weight of active elements (tube/transistor) exceeds about 4,000. For a smaller number of active elements, use of vacuum tubes will save weight, the Bendix study indicates, and the tubes gain in the nuclear power level increases.

For example, a spacecraft using a SNAP-2 generating 10 kw. will save weight by using tubes if the number of active elements is less than approximately 10,000, according to curves presented by Edmond.

Spacecraft equipped with a SNAP-5B operating at a 350-kw level would re-

quire a weight saving through the use of tubes if the number of active elements was less than about 20,000. The crossover point between tubes and transistors is difficult to define precisely. This is due to limited data available on radiation damage susceptibility and the fact that calculability varies with the type of tube or semiconductor.

Bendix has theoretical vacuum tubes in a reactor enclosure, called TUMMS, made by General Electric, pose the greatest threat to semiconductor in a

radiation environment, the Bendix study indicates. The TUMMS offer a significant overall weight advantage beyond payload complexities of 100,000 active elements.

The analysis was based on locating the active elements payload at one end of the spacecraft with the nuclear reactor at the opposite end, using physical separation to achieve some radiation protection. Additionally, the Bendix study examined the use of a vacuum tube shield of lithium hydride and tungsten to reduce neutron and gamma radiation (see drawing above).

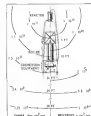
For a 3-kw SNAP-2-equipped spacecraft, a 15-ft separation distance was assumed, while a separation of 55 ft. was used in calculations for a 30-50 kw SNAP-5 and a distance of 95 ft. for the 350-kw SNAP-5B.

An urgent need exists for definitive radiation reliability data through testing and analysis, Edmond said, to determine more precise damage levels and how to failure for a wide variety of components.

For example, the weight of shielding required for a SNAP-5-equipped spacecraft ranges from 300 lb. to 1,500 lb., depending upon which data are used for transistor susceptibility in radiation damage. If the optimistic figure is adequate, the spacecraft could carry an additional 1,000 lb. of payload.

In other reports presented at the National Aerospace Electronics Conference, the following schemes are available were reported:

- Ejection lanes, in which weapons are



RADIATION in gamma ray and neutron flux is shown for isolated 300 thermal kilowatt nuclear power source producing about 30 kw. power, comparable to SNAP-5B.

## Best short story of the year

*...written by a Douglas DC-8*



To how big an airport do you have to reroute a jetliner, if its scheduled landing field is locked in by fog?

If it's a DC-8 or DC-8F, not very big. The DC-8 has been approved by the F A A. for the shortest landing field length of any long range jetliner. It needs airports with runways no longer than those which can handle a DC-6....and that often means as small as 5,000 feet.

Credit some of this capability to a new landing gear modulated anti-skid system which continuously monitors all brake pressures to maintain optimum traction. Also to the important fact that the DC-8's control at low speeds is superior to that of any other jetliner.

But even before the new landing gear system was perfected, DC-8s had landed on runways shorter than 5,000 feet. This capability is characteristic of the extra margin built into so many of the DC-8 and DC-8F systems.

And as for fog, latest Douglas transport designs already are capable of operating at weather minimums of 200 feet and  $\frac{1}{2}$  mile visibility. Developments will soon lower these minimums to 100 feet and  $\frac{1}{4}$  mile, and may eventually achieve fully automatic landings when ceilings are zero.

DOUGLAS BUILDS GREAT TRANSPORTS

**DOUGLAS**  
AIRCRAFT DIVISION

## TEST STAND INSTRUMENTATION

### What's happening?

... to the temperature, to the temperature flow, to the pressure flow, at the nozzle and where else? Only the instrumentation knows the sure as a booster goes through its static tests ... and which the degree of readiness?

To get answers instead of further questions, many Prime Contractors find the optimum solution in sub-contracting the total test stand instrumentation to a single company. When that company is EG&G, the possibilities are many.

As instrumented an contractor for the Kivi and NERVA engine test stands, EG&G has demonstrated a competence that ranges from a high degree of innovative engineering in problem solving, to the industrial and administrative capacity in depth to develop and manage complex systems of great magnitude.

Among the many specific examples that demonstrate this range of ability, are:

... a unique, Log-N Amplifier which compresses the 11-decade dynamic range of engine-nostrating test channels to usable voltage levels, and

... a 3000 channel data acquisition and recording complex with complete TV-photographic coverage, side communication and environmental safety built-in.

This broad and intensive experience pays off by saving customer

frustration and duplication of effort for the Prime Contractor. EG&G's trained field management and engineering specialists apply and refine the most advanced existing systems and components to the immediate prob-



lems. The Prime deals with a single manager, who is fully accountable for the total instrumentation task and has at his command an able staff of other associates and engineers with solid industry experience. The result is on-time success/reliability.

If you would like to know more about this expanding capability and EG&G's other capabilities, write me. If you would prefer to have us show more about your capability as an individual, send your resume to: Elton Harris, Dept. A-164, 110 Brookline Avenue, Boston 14, Massachusetts. EG&G is an equal opportunity employer with no special opportunities in our fields.

**EDGERTON, GERMESHAUSEN & GRIER, INC.**  
166 BROOKLINE AVENUE, BOSTON, MASSACHUSETTS



is diffused into a pillow attack, just has instead of its, more common and now shifting the laser output further into the infrared region to about 9000 Angstroms was reported by Dr. H. T. Menden of the Sperry Rand Research Center. Menden also reported that his company is working on infrared photomultiplier tubes having band widths of about 10 nm.

• **Modulation of injection laser by varying the ambient pressure** measured by the crystal diode was reported by Dr. J. D. Aze of International Business Machines Corp. The understanding effect, which also occurs when diode temperature is raised, results in shorter wavelengths because the pressure is increased.

• **Greatly improved thermoelectric cooling by operating P-N junctions in a magnetic field** was predicted by John R. Stulow of Acoustical Systems Inc.'s Electronic Technology Laboratory. In predicting increased use of thermoelectric cooling to achieve cryogenic temperatures, Stulow cited a closed-cycle thermoelectric refrigerator built by Philips Laboratories, which could face room temperatures of 300K down to 90K, using 1 mW of electric power to pump out 1.7 milliwatts from 1 cooled channel.

• **Effort to stabilize laser frequency against its frequency base drift**, currently under way at Technical Research Group Inc., is expected to yield a long-term stability of better than 1 Hz, corresponding to their part in 10<sup>10</sup> times LaTourne of TRG reported.

• **Stoppage-down control system** designs in a DC-1 have shown that a suspended system has performance comparable to conventional control systems using standard platforms, according to Joseph Levine, Ford Instrument Co. Levine said that there was no degradation in performance due to high angular rates of the aircraft and its vibration as in the high-speed conventional attitude computers required for such a system. Instead, what would be experienced in a conventional system using conventional

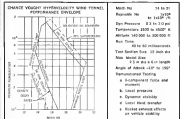


SMOOTHVENTIONAL communication and the noise index study in Rochester would use isomorphism to transfer signal to the HP VHF band to beyond line of sight range with UHF used to relay the signal to ground terminals at other end. Communication between satellites would not require dual-band antennas at proposed frequencies.



### NOW... DATA AT MACH 14 TO MACH 21

Space and air-city vehicle designers can now obtain data in the Mach 14-21 range at the extensive hypervelocity facilities of the Chaco Vought Wind Tunnel Laboratories. Supporting equipment and instrumentation is available for experiments on basic aerodynamic components, heat transfer, pressure distribution, dynamic stability and jet exhaust effects. Specialized sensing instrumentation designed and fabricated by Chaco Vought give a high degree of reliability. The performance envelope for the hypervelocity tunnel is shown below. □ This facility is one of three Chaco Vought wind tunnels: low speed, high speed, and hypervelocity. Fluid costs are available for your total project. There are no extra charges involved. Write today for Bulletin PDS 60-2-3 and see how you can make use of this important space-research tool. Wind Tunnel Laboratories, Aerodynamics and Mechanics Division, Chaco Vought Corp., P. O. Box 5907, Dallas 22, Texas.



**LTV** LEADERSHIP THROUGH TECHNOLOGY



Photo by Reeves Industries Corporation  
Given Day Item York

## Inland Gearless Torquers give 2-axis precision to Reeves Radar Pedestals

**Precision Radar Pedestals**... manufactured by Reeves Industries Corporation... give wide range in major satellite and missile projects. Designed to accommodate rotations up to 360° in direction, they feature Speeded Impulse recovery, azimuth load bearing ratings at 250,000 pounds and tracking rates from zero to 30° per sec azimuth and from zero to 1.7° rad/sec in elevation.

**Accurate Force over-riding** of these Reeves Pedestals is effected by Inland Gearless Torquers giving up torque output from 100 to 1,000 pound-feet.

**Fast, high-resolution response** to sensor-position error signals is a major reason why Inland Gearless Torquers with so many models and drive-vehicle arrangements. The superior performance of these direct-drive 40 torque motors comes from torque-to-inertia ratios 30 times higher than equivalent gear-drive servo motors. Moreover, the compact, precise construction saves space and weight restrictions.

**What's your problem?** If you're currently planning a servo system calling for output torque between 25 ounce-inches and 2000 pound-feet\*, consult Inland Gearless Torquers with any alternative. Write for all the facts today, 340 King Street, Northampton, Massachusetts.

\*Higher torque output levels can be provided on special order.

**INLAND MOTOR CORPORATION**  
A DIVISION OF **KOLLMORGEN**

components. Using gears with a 0.1 deg./50 disk rate, the stepped-down system demonstrated an average error of about 1.2 arc for all flight, according to Levine.

• **New spacecraft attitude control techniques**... which use a combination of gravity and earth's magnetic field and eliminate the need for moving parts within the spacecraft, was described by A. G. Buckingham of Westinghouse Aerospace Division. Initial disturbance would be achieved through interaction with earth's magnetic field, while a subsequent transition to local vertical and earth-tilt plane is achieved by gravitational and magnetic torques. Buckingham said that the longer launch is too low to correct for third-axis alignment torques which might be generated by other position corrections, rockets. Spacecraft equipment would include a gyroscopic tor and solar cells for attitude sensing and three coils for producing a magnetic field to interact with earth's field. Spacecraft attitude would be maintained to the ground, whose required control outputs in each coil would be computed and transmitted back. Analysis indicates the system could maintain spacecraft anti-rotation within 2 deg. despite disturbing torques of 25 dynes-centimeters. Buckingham said a **Hybrid inertial/Earth** navigation system was proposed for use as a stand-alone flight as a report by Stuart B. Chrysler of Sperry Gyroscope Co. Convention was John J. King. By using Lorentz force to correct perturbations as external orbital errors, navigation errors could be reduced to a fraction of a mile. Chrysler said Sperry is designing a Lorentz digital decoder and computer circuit, which accepts a



**UHF Receiver**

Ultra-high frequency (UHF) command receiver actually receiving a 218,000 Hz. After turn over to a high-frequency tracking motor when a discrete signal is received during descent. Following only minor physical damage, the dual-channel receiver system continued to operate satisfactorily on two of its four command channels. The motor, Model K-120, was manufactured by Advanced Communications, Chesham, Calif.



## AERO-THERMODYNAMICS

North American Aviation's Space and Information Systems Division assigns the role of research and its application to the spacecraft development and spin-off as well as research and development of space vehicles of the future.

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**SPACE AND INFORMATION SYSTEMS DIVISION**

North American Aviation

IASTR-500 package, suitable for each use.

• **New type accelerometer** using the Solen principle, but as a photoconductive cell containing an electrolyte whose area exposed to a change of acceleration. The new device offers a low threshold sensitivity, wide measurement operating range, and adequate resolution. Adair's Joseph W. Hiding reported. The device has no hysteresis, is accurate to within 0.1%, has no moving parts and weighs less than 1 oz. Pricing not available.

• **Fluorescent engine exhaust** strongly reflects radar energy, providing target enhancement for space reconnaissance. Republic Aviation's Gerald Levy reported. For a pulsed plasma jet engine of the type used in Republic reconnaissance, the frequency and duration of the strong radar echo provides a convenient signature which enables another spacecraft to locate and identify its reconnaissance target more easily.

• **Unconventional communication and data systems**, which would utilize a wave guide effect produced by different layers in the ionosphere, to transmit HF VHF signals between earth and space, with UHF frequencies used to link spacecraft to earth terminals, was suggested in a report by Dr. Mario D. Costa of Republic's Space and Information Systems Dept. and James L. Butler of ASD's Electromagnetic Warfare and Communications Laboratory. One drawing, a 701 Transmissions between satellites would be in the 1.5 to 30 m band, allowing the need for direct-wave accuracy and penetrating the use of lower frequencies to achieve global coverage from earth with conventional ground-to-satellite radio wave configurations.

Comparisons by Republic, under ASD sponsorship, indicate that path losses of 10 db using the area between the E layer and F2 layer (between 100-150 km altitude) would be only 14 db over a distance of 33,700 km, or roughly half was around the earth. Costa and Butler suggested experimental verification of the technique using two special satellites equipped with 100 m transmitters or using balloons planned for other experiments which will have transmission for space-to-space ranging experiments.

• **Lower losses communications** while passing through stratospheric plasma regions to find communication in orbital or lower system receivers measured less than 4% during recent tests by Douglas Aircraft. This routine theoretical studies indicate that a laser can be used for general communications during reentry. Richard C. Stokes reported. Douglas tests, conducted in a hypersonic wind tunnel, and a ruby laser pumped by a helium flash tube with outputs up to 4,000 pulses. The report was authored by S. Lee D. A. Mayer and C. L. Reeder.



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## HOW MUCH SHOULD A TRANSDUCER COST?

\$100? \$500? \$2,000? It depends. How small must it be? How severe is the application? What accuracy must it perform to? All determine the price. Servonic's L-113 was developed for a missile program at a company sponsored cost of nearly \$50,000. It sells for \$400 in quantity. Here's why. It weighs only 1.7 oz. and measures  $1" \times 1"$ , yet it will withstand 100 g acceleration with an error of less than 1%. A patented force summing mechanism is utilized to detect pressure change which is transmitted as a proportional linear movement through a metallic belt linkage to the wiper of a precision potentiometer. This is accomplished by an aneroïd capsule connected to the inlet pressure fitting. Pressure media are contained within the aneroïd capsule, isolated from the electrical component to enable operation in deleterious atmospheres without adverse effects. Wipers are precious metals. Platinum alloy wire is used as the resistance element. Forty-seven separate operations go into assembly of every unit—each individually checked for quality and reliability.

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## STP FILTER CENTER 02000

► **Later Crystal Grows With Flat Surface**—New technique for growing ruby laser crystals that results in internal flat end-surfaces, whose parallelism permits that obtainable by cutting and polishing, has been developed by scientists at Bell Telephone Laboratories. Interferometry measurements indicate that optical length of a crystal with sidecutting faces 1.5 mm apart varies only 0.1 wavelength of red light over the entire reflecting faces, BTL says. Additionally, radiation losses through the crystal are less than 1% per pass, most of which is due to imperfect end-surfaces, namely, BTL says. New rubies are produced by flame-grown process in which crystal is grown slowly at temperatures far below its melting point.

► **Aerojet Role in Voice Analysis**—In line with current Defense Dept. emphasis on voice analysis, McDonnell-Aircraft Corp. is introducing all-voice equipment aboard Navy's F-8 for possible night-coast surveillance. The example it is evaluating, the AGU-73 Incoherent Speech Display, which has transducer amplifier built into receiver unit as a replacement for the A7413 indicator, which requires separate amplifier unit with interconnecting cable. The new AGU-73 not only weighs 40% less and costs about \$1,000 less per instrument, but also eliminates interconnecting cable which is potential source of unreliability.

► **NASA Laser Tracking Test Facility**—Coddled Space Flight Center is building a remote facility, which will be used to evaluate optical laser techniques for tracking satellites. Facility will include large, extremely precise and rigid mount for such equipment, with freedom of movement in azimuth and elevation, which is expected to reach about 25 tons according to Dr. Homer P. Smith, head of GSFC's optical systems branch.

► **Writing Diagram Preparation Mechanism**—System for mechanical preparation of electronic wiring diagrams, which eliminates tedious drafting process, has been developed by Westinghouse Electric Company. It has prepared how-to-do-it manuals which it is making available to Defense Dept. for distribution to other defense contractors. System uses photocopied, sequencing machines, built by Huma-Mototype Corp., which project lines, symbols and words to be placed on photographic film using air-image keyboards. Technique saves 75% of time required by hand-drafting. Wire diagrams save. Machine sequence works from sketch by design engineer.



## Continuous-Process Microcircuit Production

Continuous-process thin-film microcircuit production facility, developed by Western Electric Engineering Research Center, can produce 1,000 sq. in. of multichip film per hour. Glass or ceramic substrate mounted in slide holder (lower left photo) is placed in conveyor (at left in photo above) which transports it through 11 chambers where various level coatings to 10<sup>-4</sup> in. are applied. First four chambers have infrared lamps and reflectors to bake out residual gases and surface contaminants from substrate. Titanium film is sputtered onto substrate from cathode in vented glass (lower right photo) in film thickness of about 1,000 Angstroms (one-millionth of an inch). Mechanical probe is used to control voltage in film (deposited to less than 150 Angstroms in a border layer). An ultrasonic wave to end of the line of chambers, removes deposits to prevent out at one atmosphere.



► **High-Speed Micromeritics**—Socoma-Walsh Inc. Solvina to measure soon the suitability of semi-conductor materials. Computer function capable of operating at 35 ms. speeds, nearly twice the speed of devices now available.

► **New Laser Modulator Material**—New material for use as a Pockel effect laser modulator, capable of operating at six inverse microseconds, has been developed by Aerovis Associates, Inc., Galesville, Md. The material, hexamethylsiloxane, known as HMTA, has been operated at 1,000 ms. with a gas laser. Corporation says its properties are superior to previously used KDP and ADP crystals and it can be grown in remote locations. HMTA's electro-optical properties are superior from d.c. to microwave frequencies, company says.

► **Nickel-Cadmium Battery Life**—Improved life span of nickel-cadmium batteries is achieved when oil temperature

is maintained at about 70°F, with shorter life at either higher or lower temperatures, according to results of life tests conducted by Cook Electric Co. under Air Force sponsorship. Tests also show that oil-film dielectric changes could also enhance battery life. Results are contained in report entitled "Alkaline Battery Evaluation," identified AD121-477, available for \$5.50 from Office of Technical Services, Commerce Dept., Washington 25, D.C.

► **On the Corporate Checkbook**—General Precision Equipment Corp. and Robinson, Inc., have terminated week-long negotiations toward GPE's possible acquisition of the major telemetry products. Company spokesman that GPE still is anxious to acquire a company with telemetry data communications capability. United Aircraft Corp.'s Norden Div. will make and sell Loran-C navigation aids developed for it and will use as Decca Navigator Co., London, under license agreement.



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## Laser Transmits Voice In Showing by IBM

New York—First voice transmission over a light beam with a pulsed-laser frequency modulation technique has been demonstrated by International Business Machines Corp.

The frequency of which pulses are carried from the laser are modulated so that they can represent voice or other information.

Based on the voice transmission it is a special modulation circuit consisting of

a delay line with a controllable charge time. When the delay line potential reaches a predetermined value, a laser beam at the end of the line breaks down, discharging a 0.2-microsec., 5-megapulse through the laser.

Charge time of the delay line, and consequently, of the laser pulse frequency, is determined by the amplitude of the information signal. Pulse repetition rate from 300 cycles/sec. to 1 kilopulse/sec. was demonstrated. The voice channels are possible, as is other information.

Pulse repetition frequencies up to 100 Hz, which would increase the num-

ber of available voice channels are expected in the future. Frequencies of 30 Hz can now be obtained with minor modification of the modulation system, IBM officials said.

Pulse-frequency modulation technique is a low-power, high-efficiency method of communications compared with modulating laser systems because the laser uses only 10 to 20 milliwatt power to 0.1 W peak output power. Average power is 1/700 of peak value.

The pulse-modulation technique using a laser combines the most significant qualities of frequency modulation with confinement of the transmission information to a very small area in space. This area is distinct from the diffuse character of other directed radio transmissions.

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Uniquely versatile, the ESR-150 lets you weld standard or exotic materials in extremely thin sections (0.002"), and then, with the same power supply, switch to heavy-gauge metals quickly and conveniently.

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## NEW AVIONIC PRODUCTS



• Finished multi-layer circuit boards are now available with up to 30 layers in a 4-in.-thick board. Layer-to-layer interconnects are provided by plated-through holes, either conventional or blindless, penetrating internal conductor connections to be metallurgically bonded to each other. Dielectric breakdown voltage between layers is more than 1,000 V rms, and maximum insulation resistance between layers is quoted at 1,000 megohms. Manufacturer: Glavin Electrical Manufacturing Co., 1729-15 W. 136th St., Garden, Calif.



• Miniature rotary switch, Model MRA-110, can be adapted for 2 to 12 positions. Switch mechanism is 5-mil. dia., comes with phono knob, and has non-durating contacts with 35-amp. non-mercurated. Manufacturer: MCO Electronic Products, Inc., 7 Walnut Ave., Lawrence, Mass.

## MANAGEMENT

# Blackburn Memo Criticizes TFX Decision

Alfred W. Blackburn headed the F-111 (TFX) tactical fighter aircraft program for Dr. Harold Brown, director of defense research and engineering from 1961 to 1965. He submitted the guidelines for the aircraft and drafted the Communications Defense System Sublet 2 Memorandum on Sept. 1, 1961, to start the F-111 program.

The Senate Permanent Investigations Subcommittee, which is probing the cost of the aircraft, has raised several questions of a memorandum in the record that Blackburn sent May 1 to Dr. Brown, detailing the F-111 job and the criteria of McNamara's decision to award the contract to General Dynamics Corporation rather than the Boeing Co. (AFM May 27, p. 37).

Avionics Week of Space Technology previously published McNamara's statement he has the information (AFM May 24 p. 3) and the opinions of General Dynamics Corporation (AFM May 26, p. 36), as well as 40 copies of copies of the program. Blackburn the complete program, this too was published a month before the Blackburn memorandum.

On Sept. 1, 1961 the Secretary of Defense made the decision to proceed with TFX weapon system as a joint Air Force-Navy development program with the Air Force acting as the executive agent. This decision was made after more than a year of study and analysis of the pros and cons of such a program. Neither service wanted the program to proceed as a joint development because it would deny them the privilege of autonomous developing their own weapon systems. Moreover, there was a feeling that it would be unwise to have the entire high performance program for the next generation (including aircraft) covered by a single development effort. Finally, there is a strong feeling held by many of the "old guard" in the weapon system development business that competition between the Air Force and Navy tends to generate better, more effective weapons.

### Technical Arguments

Throughout the current phase there was never formally stated by the services, but rather they chose to argue against the joint development program on the grounds of technical unsoundness. This was a time when the Air Force was making a decision to bar the Navy F-4H program and decided to support much of the F-4H scheduled production with the Navy-developed F-4H. Thus, the continuing Navy-developed aircraft will be the backbone of both Air Force and Navy tactical air power until introduction of the TFX. The question of technical

feasibility is indeed difficult to substantiate under these circumstances, particularly when one contemplates the very much greater flexibility of operations offered by the acquisition of such TFX aircraft as the variable sweep wing and the shockwave turbojet engine.

In his Sept. 1, 1961, memo to the services, the secretary provided certain guidelines under which the development was to be undertaken. The Air Force SOR-151 was to be the basis for the work statement that would go to industry. On top of this SOR, there were added certain guidelines to weight, would have for recommending an adequate side-by-side, low-level, low-altitude, conventional weapon carriage capability, and Navy service capability.

These matters were negotiated with General LaMay and Admiral Rosell (see the final report of the Sept. 1 memo).

On Oct. 1, 1961, a request for proposal was submitted by the Air Force to industry, which RFP incorporated the above-stated guidelines. This work statement was received by GDR&E (Office of Defense Director of Research and Engineering), and certain modifications, though made solely in the period for proposal submission. These changes related primarily to carrier compatibility features. Prior to the submission of the proposal, it was recommended by Dr. (Herald) Brown that because of the potential magnitude of the TFX program and because of the

inherent lack of competition, it would be a good idea to select the two top proposals and proceed through a further design refinement period wherein both of these variations would be tested for their effects. One proponent for this was the WS-110 of 200 competitive between Boeing and North American was carried on a fiscal basis for more than a year during which very large and significant improvements in the design proposals were offered. This recommendation to proceed with two contractors was, in fact implemented, and on Feb. 1, 1962, it was announced that Boeing and General Dynamics would be awarded a \$1-billion contract each and given 50 days in which to make their respective designs.

### Labor Proposals

The second proposals were submitted May 1, 1962, and the evaluation thereof was completed June 1, 1962. Subsequent to evaluation of these two proposals, although the Air Force was satisfied, the Navy felt that its requirements could be met by neither proposal. A memo was prepared by (Navy) Secretary (Ford) Korth's signature stating that the Navy could not act on the aircraft and recommending that the Air Force be allowed to proceed independently with its development for this unique use. When it was learned that such a memo was in preparation, it was noted that in a previous (Vice Adm. Robert B. Peck, then deputy chief of naval operations for air) that such a proposal could only result in delay to

## L-T-V Studies Tactical VSTOL Designs

Defense-Tactical VSTOL aircraft configurations, utilizing a high-lift into takeoff, are under study here by Long-Term-Visioning in a program which the company is heading.

The project, termed Adam 2 (the definition and acquisition), is a follow-on to an earlier company headed study called Adam.

One configuration considered in the company headed Adam 2 program calls for a two-engine, two-axle side-by-side, with the propulsion from fixed side-by-side in propulsion pods on either side of the fuselage. The pods would also be designed to provide auxiliary lift.

From losses on the wings each would mount a single external podding tail rotor. Pops on the trailing edge of the wings would be used differentially to provide roll control. They usually would be used as the major means of action deflection in VSTOL operation.

Proposed configuration would incorporate, as a propeller, the power turbine to the basic propulsion through large ducting, with one engine driving the two outboard line and the other the two inboard line. This arrangement would permit shifting down either engine in flight to provide extended range, or could be used in the latter condition.

In the latter condition, the arrangement propellers would continue to provide maneuverability through the common ducting system.



the program since the Secretary had already decided to proceed with the post development. Ada Post then took it upon himself to get together with the Air Force and convince them that greater attention should be paid to the unique problems of Navy jet aircraft.

As a result, instead of the camera being signed by Mr. Keith, (Air Force) Secretary Eugene M. Zuckert requested additional time in which to attempt a satisfactory selection in the Navy's problem.

It was decided to give the construction an additional three weeks to

smooth the differences in the Navy version of these design proposals.

At the recent discussion of the original work statement and the Navy's differences is appropriate. Originally, the Navy agreed very strenuously for testing, more on size and weight because of the unique requirements of carrier operations. The original guidelines were based on these very real problems. When the selection goal of (blank) was established, it was done so with a view to using the GE engine, while at that time size was not a factor. When the GE engine was found to have an unsatisfactorily optimistic development

program, it was eliminated from consideration and the Pratt & Whitney engine was selected for the TTX. This selection was accomplished after the first design competition. The selection of the P&W engine, which is slightly larger than GE engine and has a greater thrust rating, meant that the TTX would be a larger aircraft and this (blank) its weight limitation for the Navy mission could not be met using this engine. Subsequent to the second evaluation in order to minimize the Navy's reservation about both design proposals, there were added to the Navy performance requirement an ability to perform a (blank) maneuver at 35,000 ft altitude, at cruise design gross weight and at lower Mach number without buffet onset. Buffet onset was further defined as a (blank) per hour. This requirement, which is a very difficult one indeed to meet, had further impact on the weight of the aircraft. In effect, with this additional requirement, the Navy was saying "we are less concerned about weight and size per se than we are with total operational utility." The impact of this added requirement was that the Navy aircraft would require considerable gross weight and thus any proposal submitted to date.

The response of the two competing contractors to the Navy decision is substantial in their second proposal and clarified by their additional requirements was with difference. On June 16, 1963, these proposals were submitted to the SP4, WPAFB (Seventh Flight Office, Wright-Patterson AFB) General Dynamics presented its proposal on the morning and it was done just on atmosphere of complete peace and confidence given, with the result that they presented what was their solution to the Navy problem out of which selected two as being the most desirable. In one of them, the Air Force function was used with a brand new Navy fuselage. Upon conclusion of this presentation, the impact on the Air Force was such that the Air Force felt that the whole concept of a heavier TTX development had been completely lost. It was as though the Navy had at last found and recorded in having accepted an additional requirement that would indeed make a business development technically feasible.

That afternoon the Boeing Co. presented its answers to the Navy problem and a more workable and professional approach coupled with the imagination applied to the Navy problem could not have been asked for and only (blank) a common design procedure, but it appeared that the Navy would of Navy technical objectives that

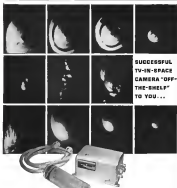
for the first time one of the two patterns had come to terms with its problem and offered realistic solutions. What is even more interesting is the fact that not only was the Navy airplane required to enter design proposals given by the Boeing Co., but the Air Force airplane also profited from the proposed improvements. This point is Air Force performance was reflected in greater load carrying capability, shorter take-off and longer taxi range. The cost of these improvements was in a somewhat higher gross weight and greater expense dog.

At this point in time there was no doubt in anyone's mind as to the relative competence of the two competing companies. However, there was brought to light at this juncture a difference in management philosophies of the Air Force and the Navy. Although the Navy was perfectly willing to admit that Boeing represented the most acceptable source for procurement of the TTX, it was defined in the work statement, at that point, that the estimated effects of the subject substantiated changes to the Boeing wing, particularly with regard to the high lift devices that had been added, had not been adequately validated by analysis and test because of the very short period of time allowed the company in correcting the Navy deficiencies.

The Navy stated that before it would commit itself to the development of the Boeing aircraft, the company must be given time to validate its latest design proposal and the Navy must be given time to evaluate the validating data.

The Air Force on the other hand was perfectly eager to commit itself to the Boeing Co. in a source and refine the design as necessary as the development proceeded.

Thus, another engine was trucked where a full and free commitment by both services to the favored design could not be established. Failing to get a commitment from the Navy to that WPAFB development, Secretary McNamara made it known that he would not permit the continuation of the program with a single contractor and elected to outsource the competitive nature of the process for another 90 days. This was an exclusive an additional \$1.5 million to further refine this design proposal and validate these data. The Air Force and Navy would have 60 days to evaluate the contractor's submission. The Secretary evidently also considered that the large variance between contractors' cost estimates and the much higher cost estimated by the Air Force. At the start of this next round, Secretary Zuckert contacted the SP4 to test each of the competitors as though they were a power contractor and work



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[illegible]

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[illegible]

### Beryllium Use Tested

Washington-Arlington Research Corp. (WARC) has successfully tested a large number of cold-welding fixtures using barium as an additive to achieve faster oxidation heating, thus producing higher-temperature welds.

Because of its toxicity, the herbivorous additive moths are expected to have wider potential applications for upper stages than for hunters. In the skin fungi conducted at the company's Pine Ridge, Va., and Goshute, N.C., facilities, the cabinet areas were filtered before being released into the atmosphere. Tests at Pine Ridge were made in a chamber at both sea level and altitude locations.

The AEC's verylow additive development project is being conducted under an AEC-EPA contract and is funded under the Advanced Research Project Agency's Principle project. Principle is a grant-based study to advance the state of technology in solid, liquid and hybrid lubricants, woodcements.



## HOW SCIENCE GREW SUCH LONG ARMS

What's a life source—out in the far reaches of space? ■ Man is only beginning to gratify his insatiable curiosity about the worlds beyond this world. He's looking. He's listening. And he's stretching out long arms with electronic fingers, to catch and measure radio signals originated on earth from somewhere, then reflect back to us from the moon, the planets and even distant stars. ■ Before World War II—when radar first was conceived as a means of saving the lives of armies and sailors—the effective range was a few hundred miles at best. Only a few years later, man-made electromagnetic pulse beamed the moon and returned. Man had made his first reach beyond the skies. ■ The power source for this and for all long-range radio is the vacuum tube. One possible trade mark of the tube is the name *vacuum*. It bears the name *Edison*, the trade mark of Edsel-McCullough, Inc. ■ This California corporation has an enviable record of space-age communications achievements. An Elmac tube powered the first radar contact with the moon. Another powered the only radar in the world which could track the first man-launched satellite. An Elmac-McCullough tube tracked the first space probe launched from the U.S. with Vanguard. Yet another developed the circuitry for the world's first radio pulse to touch the corners of the sun. ■ In the whole history of radar, the Elmac name has appeared on more radio tubes than that of any other electronic firm in the world. Edsel-McCullough claims that in 1938, could produce a tube which could power the U.S. Navy's first tracking radar system. ■ It was the first of a line of tubes that would be used by the hundreds of thousands. They flew in airborne radars to Guadalcanal, Iwo and Normandy. They went where with the Army and the Marines, spotting mortars at Kwajalein and Iwo Jima. ■ For navigation, detection, ranging and fire-control they powered our radars wherever our forces went. ■ Today the Elmac name is associated with whatever power source is needed to make the radar network work. ■ Commercially, the modern radar circuit with the U.S., Canada, Europe, the Middle East, the Pacific and Southwest Asia. ■ In its laboratories, Edsel-McCullough now has a million-dollar test instrument which will produce ten amperes of direct current at more than three hundred thousand volts, enough to power any tube that the industry needs. ■ The instrument can produce a wide range of waveforms, frequencies, requirement ratios for coherence, pulse duration, controlled phase and frequency drifts. These all, in turn, for developments now in progress at Edsel-McCullough: electron power tubes capable of even higher powers, at even higher frequencies, even over ultra-bandwidth. ■ In the summer of 1964, Edsel-McCullough's largest and longest experienced operation was the Elmac-McCullough radar system which was the focal point of the radar tube problems of tomorrow.

\*There's no smoking gun, it can be told story about this rather than 'couldn't be made.' It's proven to the contrary. When Joe. When Bush is a threat. Take



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Here, in Lockheed Missiles & Space Company's Physical Sciences Laboratories, scientists are engaged in a program to use space physics research program embracing experimental and theoretical work in space relativity, a cosmic atmosphere structure, geomagnetic interferences, x-ray astronomy, and the propagation of electromagnetic waves in space. Experimental programs include the measurement of geophysical and space phenomena, both in space and in the laboratory.

Currently, measurements of variations on the earth's magnetic field are being made at remote stations in the Pacific Ocean, providing data in the effort of solar activity on its shape and stability. The influence of solar wind on the geo-



magnetic field is also being investigated in laboratory experiments, by bombarding magnetic fluids with clouds of highly ionized gases.

Scientists at Lockheed are engaged in a detailed program of designing and placing density gauges, mass spectrometers, ion traps, and similar instruments on space vehicles to measure the density, composition, and temperature of matter in space. These experiments lead to a better understanding of the chemical reactions occurring in the atmosphere high above the earth.

Important investigations of the low energy x-rays emitted by stars are being carried out and interpreted to give information on the structure of stellar coronae.

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## LOOK AT LOCKHEED IN SPACE PHYSICS:

Continuing investigation of matter and forces in space



# FINANCIAL

## Small Firms Face Tight Financing Period

By Ward Wright

New York-Public disinvestment with so-called "glamor" stocks and a more cautious investor attitude point to a period of tighter money for small enterprise and smaller firms seeking financing.

One sign of this is the firm new stock issue brought to the market since the May, 1982, market slump. Securities and Exchange Commission clearing the last year showed the smallest listing of public offerings on record.

With the market virtually closed to enterprise companies and the investor and investor funds are fertile grounds for these—venture capital capital is largely limited to individuals in the private firm specializing in risk financing, and to a relatively new source: Small Business Investment Companies (SBICs).

SBICs are known by the Small Business Administration (SBA) under the Small Business Investment Act of 1958 to provide promising small businesses with equity capital and long-term loans. As an inducement to investors, the federal government will match SBIC funds in a 2-to-1 ratio to provide total funds as high as \$1.2 million. Therefore federal participation helps off. The advantages are also granted under the program.

### Business Loans

Since its beginning in 1959, the SBIC program has undergone dramatic changes in its approach to lending to small businesses. Now emphasis is on a company's products and management rather than research and development. As one financial observer put it, "Is the one factor we won't ignore is whether company able to sell its and own four wheels off the ground."

Charles E. Sells, president of Electronics Capital Corp., San Diego, Calif., summed up the change in SBIC attitude when he told a meeting of the New York Society of Security Analysts, "We have learned to look past the size brochure and other corporate info to the real potential of a company."

At the outset of the SBIC program, the stock market was experiencing the beginning of a state of speculative buying and selling of comparatively low priced, unlisted stocks—many of them strategic and electronics companies seeking business-office expansion in

land on the stock exchange and add in the over-the-counter market. The speculative fever was based largely on hope of quick capital gain based on response with a few highly successful companies and electronics firms.

To hang a "paper cup" sticker label on the house is a guarantee, however. Such words as "space," "electronics," "microelectronics," or the like, in the name of a new company often were a guarantee of a new market run—whether or not the company could run any capability in the aerospace field.

This speculative time was to include a very popular of SBICs they were filled with federal money and offering significant tax advantages to high income bracket investors, the number of new SBICs multiplied rapidly between 1959, 1960 and 1961 and peaked at their stock rise.

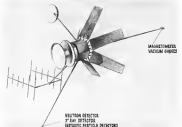
SBICs were in a position to answer late to get the new money, and they were getting with the market for new offerings. "As that time," a spokesman of one large SBIC said, "the question was whether we could get the new money. Investors left they couldn't lose, and the market was soon flooded with 'glamor' labels."

Third sign of a trend is the glutted stock market since about a month before the May, 1982, stock market slump, when some of the smaller firms began to fold and often weren't experiencing expected growth.

A spokesman for a group of SBICs denounced one cause of the decline of the growth companies as "The bright chips broke away from the parent companies and toward their own [independent]. They had good ideas, but were R&D oriented, used to working on budgets they just never had to 'poor' how it. It's not enough to have a good product... you have to be a good businessman." Sells, on the same subject said, "They had a better understanding, but no money."

### Investor Enthusiasm

After watching their own stocks jump to a premium in the spring of 1961, and push past that original offering period, SBICs were caught in a mini market of investor enthusiasm. The result was a decline in the price of public SBIC stock, which took a further dip during the May, 1962, market slump. Another factor in the decline, Sells



### Possible Solar Probe Configuration

Possible solar probe configuration is shown in Martin Co. drawing. Martin, General Electric and Philco are studying requirements of such a probe for National Aeronautics and Space Administration (NASA) May 6, p. 122. Due to top world does the spacecraft from the sun, and the four-like arrangement of instruments in the extreme system. Probe would be designed to approach within 15 million miles of the solar surface.

## 11

## Which one is the shark?



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cost, grave abuses do occur, and additional controls and improvements are needed, the picture is not one of pervasive fraudulent activity."

A section of the report dealing with the "new issue, phenomenon" between 1979 and 1981 was based on an interview extension of 21 new issues that went to a premium immediately after their offering.

By November, 1981, the report said, most of these issues were still traded above the initial offering price, one was at the offering price, 15 were below the offering price, and one had merged with another company.

### 1961 New Issues

Analysis of a larger group of 782 unseasoned new issues offered in 1961 showed 85% traded at a premium immediately after offering. In September, 1962, only 32% of these issues still being traded above the offering price. Of the issues which were then double in price, two thirds were selling below their offering price in September, 1962. The report added that in past quarters were available at all in September, 1963, for 32% of the unseasoned registered stock and 88% of the "speculation A" unseasoned common stock issued in 1961.

Some of the glories stock offered publicly had only "the slightest chance of success," the report said and that stock "could be sold to their underwriters only through questionable or clearly illegal techniques." The report noted that while many of the older underwriting firms continued useful judgments on which firms were suitable for public ownership, some firms lowered their standards of quality and size, under pressure from customers and investors hungry for new issues. Many smaller underwriting firms were heavily engaged in personal sales to the securities market, the report said, for the extra purpose of taking part in the new issues sales.

### Underwriters Influenced

Underwriters setting prices of new issues could not help but be influenced by the atmosphere of "excitement and expectation of profit" accompanying the new issues boom, the report said. While a high offering price might not be justified by traditional standards of value, a low price "usually assured a premium that reflected the public's appetite for the new new issue." For the careful underwriter, these conflicting phenomena posed a difficult dilemma. For others, "it was an opportunity to get low offering prices in the expectation of withdrawing substantial portions of the issue in the accounts of investors to be sold out to the public at premium prices," the report added.

"History" of new issues was illustra-

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lated by over-the-counter trading which began simultaneously with the electronic use of the quotation statement.

Stocks frequently were being quoted at premium prices in the after-market before all customers knew of their offerings.

Result was that before the closing the managing underwriter would meet the prospects of the offering to the room before the customers received their information.

The effect of this practice was to create a distorted picture of supply and demand, the report said.

### Other Practices

Other practices more legitimate, more questionable and more unethical, but were used to boost the available supply of stock, and more advanced practices, the report said. Some issues, already small, were further reduced by placing allotments in disclosure as requests, listing in such customers of all listed stock, and failing to deliver stock to customers.

In other instances, the report said, participants placed orders in the accounts of sales parties and employees, relatives and persons affiliated with other firms with whom reciprocal agreements had been made. The withheld shares were later released for public sale at premium prices. Demand was further increased by active subscription and subscription techniques coordinated to raise the price to one dollar, the report found. With artificial losses on the stock selling, the after-market price was a valuable item to fight changes in public demand, the report said.

Turning to the obligations of companies that stock placed held accounts, the report recommended legislation to require SEC controls on interest reporting, proxy acquisition and insider trading in stock sold on the market.

It seems wholly indefensible, the report said, that investors in over-the-counter securities should be offered low prices for those securities in later securities.

### Random Sample

Of a random sample of 1,628 companies traded over-the-counter, 21% met the financial information to their shareholders and much of the information supplied by the rest was deficient, the report said. Proxy solicitation was also found to be deficient. Among companies surveyed, 74% indicated no prospect at all during 1961 and a large majority of prospects did not list names of investors for disclosure, only the request to vote for its present management.

Conflicts in "under trading" were recommended since many firms traded over-the-counter as "under controlled" getting out of securities.

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reputable information for personal gain from trading stock in their own companies.

Lack of reliable financial information on the over-the-counter securities market makes investment advice difficult and costly, leading many investors to avoid these securities and putting the market itself at a disadvantage. Adequate disclosure of the report adds, "would tend to insure that sound companies will be the ones that will receive adequate investor's funds."

The report recommends a "balanced program" for extending federal stock legislation to securities traded over-the-counter. To reduce the advantages for insiders from buying more than 750 shares would be required the first five years, then with more than 500 shares after the following two years, and those with more than 300 shares after that.

Study of the impact of corporate publicity and public relations on the securities market indicates measures are needed the report said. Legislation and rule revision should be considered to

elevate the standards of management, public relations firms, financial news media, and members of the security industry, regarding corporate publicity, the report added.

A survey of corporate publicity "ran the gamut from straightforward reporting of corporate affairs to deliberate attempts to falsify a company's financial position and prospects," according to the report.

Much of the objectionable publicity consisted of "hypnotic sales and company projections which seem to be based on wishful thinking, glowing descriptions of new products still in the experimental stage, and measurements of output and comparisons which are only vague approximations," the report said.

Most effective counter to company publicity, the study notes, is regular reporting and widespread circulation of reliable corporate information. The study recommended consideration of laws providing criminal sanctions and civil liability to firms deliberately spreading misleading statements and unwarranted forecasts.



### Apollo Earth Landing System Tested

Bellcomm's Apollo base egress test is being by three 6-ft. diameter parachutes during drop-inject tests at El Centro, Calif. Capsule was dropped from a specially modified Douglas C-133 from 15,000 ft. System, developed by Northrop Corp.'s Victorville Div., was 13 ft. diameter chute which would be deployed at approximately 15,000 ft. during entry, followed by three 18-ft. pilot chutes, which in turn are followed by the three large parachutes. These lower the Apollo at 25 ft.

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JULY 22, 1963

## MANNED SPACE FLIGHT ISSUE

• The most important development of this decade, **MANNED SPACE FLIGHT**, will be the subject of the July 22, 1963 issue of **AVIATION WEEK & SPACE TECHNOLOGY**. **MANNED SPACE FLIGHT**, the major segment of the national space program, is planned at \$20 billion for a manned lunar landing. The total space budget requested for fiscal 1964 alone is a record \$7.3 billion.

**AVIATION WEEK & SPACE TECHNOLOGY** has established an unmatched reputation for detailed coverage of technical and industry developments on the plans, operations, facilities, budgets, organization and procurement policies of the national space program. Now, a task force of editors will concentrate on both civilian and military manned space projects in an issue devoted entirely to the subject.

Themes of the issue will stress future programs from Project Apollo to manned permanent moon bases, manned orbiting space stations and interplanetary Mars and Venus flights. Editorial highlights will include:

- Major progress report on Project Apollo, its hardware and technical developments
- Status Report on Project Gemini two-man spacecraft including joint NASA-USAF operations
- What we learned from Project Mercury and how it built a technical foundation for future manned space flight programs
- Technical needs of military in manned space flight, including Dyna-Soar, Aerospace Plane, man-readable re-entry vehicles, inspection and surveillance satellites
- Russian manned space flight programs and technical progress
- New types of support operations required for large-scale manned flight including simulations, control centers, transport and assembly facilities, tracking and data transmission equipment, medical and life support.

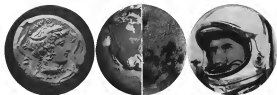
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National Aeronautics and Space Administration  
as the Astronautics and Space Committee Chairman,  
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**RELIABILITY ASSESSMENT**... effort includes assisting NASA in assessing overall mission reliability and safety levels, implementing a reliability and failure data system, and reviewing reliability and quality procedures and controls.

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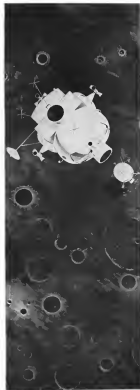
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## Motorless Chopper

Referring to May 20 issue on p. 37 we note that the last lot of generators has started. "But the chopper motor poses less significant problems in the repair environment in addition to adding to system weight and power consumption."

We have for some time been considering and acquiring mechanical light choppers which require no motor, but to lubrication problems and do not require a great deal of power.

It consists of a transmitter mounted bearing link in which are attached shafts which relay the rotation.

The weight of this device is under 1 lb. and the power consumption is under 55 m. Amperes in rotation and upon vacuum is low.

We believe this is an important advance in the state of the art.

Thomas R. Ansett

Salem, Oregon

American Time Products

Div. of Belden Watch Co., Inc.  
Woodside, N. Y.

## TFX Commentary

In the article under the TFX banner headed, *Avionics Wars* is attributed to Mr. McNamara's position has shifted from one of absolute neutrality to one of considerable hostility. This makes the program as an outcome.

It would appear that Mr. McNamara's departure of to name action on the defense industry that the Administration and the public view current rapid defense R&D efforts changed.

Chief among these beliefs is the position of leadership transition on the basis of personnel brought in the state of state at that a completely understandable at the time of his departure. The fact usually been viewed on the grounds that the need for the particular development is too pressing to permit a slow evolutionary approach.

Yet, in one other case it has been said that the same model approach would have succeeded faster, but that change.

This is closely coupled with a second problem, that of allowing automatically that will obviously, best to go on decisions, but depending with any effective policies to the contractors have as far as possible. It is not that the first object is to permit the final bill to simply states to be sure that the cost and time factors were understood as well as possible at the beginning so that after alterations could have been made fairly considered.

One has only to look at the advantages in general, finding very definite technology and to note how often a project development is postponed as a result of the fact, in this is called a system, as a result of the advance it called a head-on, in the sense of the effort of such personnel workers. All control indices by which one evaluates between efficiency and success.

placement are shared and showed by their project.

The whole defense system business has gradually become such a complex of complexity, manufacturing and acceptance action that one can only applaud Mr. McNamara's efforts to place it as a more reasonable basis. There should be more and no further investigations that some of the details at Mr. McNamara's arguments are questionable, still the overall principle is correct and should be supported.

Fern E. Garret, Jr.  
Electronics Engineer  
Worms, Mass.

Where is the "cold" deal brought out by the McNamara's? Is it fair when it is the substance of the editor's editorial case as news management? Is it a sound like to much better as the editor's deal.

Warner editorially or not Mr. TFX has made a very clear case that unless the news sources can be controlled. He brought to the reader's attention the whole picture. Cohen's situation is less satisfactory was still able and the news sources failed to provide adequate coverage and editors. Perhaps we are somewhat misled by the lack of clear definition concerning which effective power the people are willing to see the President and Secretary of Defense to handle editorial situations, but it certainly cannot be construed in a credit or as a just reply to the news people that they were duped.

The editor's report of the TFX investigation does nothing to preserve the "retained view" Sen. McNamara is probably guided by the editor's press but as doubt would be to see the good of objectiveness presented. A complete under of Avionics News editorial would have to agree to the support of the President's report that the news media exercise responsible editing in matters affecting national security. In the meantime we might ask which is it to be the highest moral, function of the press or news management?

We are amazed that hereafter the editorial situation would not also change in the country, as we show that the news system cannot keep up to date and now we are asked that the greatest thing is happen for the future in next month in the TFX investigation. This is no doubt as because now the progress can not proceed that the "last cannot always have a successful solution to have a status of professional media and experience as necessary. Mr. McNamara will certainly appreciate the editor's performance for credit opinion—"A successful system is like a second best poker hand." No matter what the crisis, the editor should always be the most prudent judgment of his own interest and never willing to keep as advanced as him.

Richard A. Duranovic  
Framus, N. J.

Year May 13 edition, is regarding on the TFX banner (p. 37), quoted Sen. McNamara as saying, "I think the public ought to know that the cost of complexity is applicable only to less than one-third of the plans, as only about 30% they are

making a great big fuss about complexity, and that is what it amounts to."

If the senator was quoted correctly, we certainly have a vivid illustration of how a man can spend months preparing to interview a matter and still not comprehend one of its own critical factors.

Even the public can dispute that the whole point of complexity in the one area from the fact that the number of Navy planes to be built is relatively small—and that, therefore, thousands of machines should not be placed into the design and testing of parts which would be possible to the limited quantity of aircraft.

Obviously the great part of the trouble arises to the few Navy planes will come from not providing the service non-commissioned which would be necessary to make these different, not from engineering concern which within the estimated cost of the aircraft, as the number required is a further display of his own inconsistency.

I suppose the senator's later statement that "This is the kind of propaganda being thrown out all over the country to try to confuse the 'muck-potting' element..." is the kind of thing you had in mind when you obviously spoke in an editorial of Sen. McNamara's objective was of conducting the hearings.

Two men electronic war style prepared in an editorial article where you stood, in speaking of the FBI's case, that "Paul Keith, Jr., Wash., D.C., tended to talk with McNamara." Was one of important to point out Mr. Keith's former position, if not in the whole situation that Secretary Keith would actually be named before members known to General Donovan? What? I didn't notice how from identification centered after the name of President Kennedy, John Anderson, Gen. LeMay, Roger Linn, William Allen in Harry Truman, also taking was any reference of the former basic lines of General (now Vice Secretary) John Chafee, who is quoted having told with Gen. Andy McNamara (McNamara) Mr. Chafee ended as PT World.

Sen. McNamara is quite correct—a "great big fuss" is being generated by the TFX investigation is, however, completely deflected concerning its own content.

R. D. Moore  
Pittsford, N. Y.

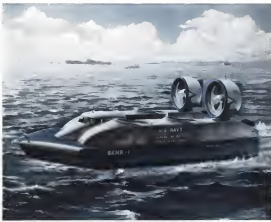
## JCS Shuffle

Tom editorial "The Birds Bellows" (AWM, p. 31) was not only brilliant in style but also extremely lucid in content.

I only wish your response had broader coverage, would this be needed, I think in obvious view appeal to have the article reported in one in each of our local news papers. The *Schlesinger*, *Quinn* and *Over* The *Schlesinger* Union Star.

It is my intention, with your written approval, to suggest that the editors of our *AWM* is to report "I think the public ought to know that the cost of complexity is applicable only to less than one-third of the plans, as only about 30% they are

D. W. Corcoran  
Salem, N. Y.



SKMR-1 is example of the model.

## SKMR-1...a new concept for the Navy

SKMR-1 Hydrokammer, largest air cushion craft ever built in this country, is developing its sea legs on Lake Erie. Built by Bell for the U.S. Navy Bureau of Ships, SKMR-1 overcomes many of the shortcomings of conventional craft by riding above the water on a cushion of air. A few of its features are high speed, zero drift and amphibious capability. Future naval missions envisioned for Hydro-skimmers include ship-to-shore transport, anti-submarine warfare, patrol, rescue and

reconnaissance. Vital statistics: SKMR-1 weighs 22½ tons, is 63 feet long, 27 feet wide, 23½ feet high and is designed to travel at a top speed of 70 knots or up to 50 knots in sea state 3. A two-man crew, four observers and a normal payload of five tons can be carried by SKMR-1. Additional loads can be accommodated at reduced height and speed. The Hydrokammer is another example of Bell's creative engineering at work for the U.S. Navy.



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JUN. 4 1963



## WHAT IT TAKES TO BUILD A PHANTOM

Phantoms—world-record-breaking fighter, attack and reconnaissance aircraft for the U. S. Navy, Marines and Air Force—are built at McDonnell, in St. Louis.

The Phantom came from advanced design engineers whose multi-service experience dates back to the mid-forties . . . Designers who laid the plans for the first jet plane to land and take-off a carrier, who designed the famous Banshees and Demons and Voodoos . . . Men who recognize the challenges of every mission ever conceived for a fighter aircraft and who design to meet those challenges . . . Men who began to plan the Phantom in 1953.

The form was drawn, reviewed, evaluated, then test flown on computers. Models were made and subjected to every condition in wind tunnels and environmental chambers. The Phantom took shape and was flexed and dropped and bent in every conceivable way. It first flew 27 May 1958. That was five years ago. Five years in which the designers reviewed and improved their concept and the Phantom began its first assignment with the U. S. Navy.

Production engineers and skilled personnel mold from titanium, gold, steel, silver, aluminum, plastic, ceramics, resins, tin, glass, rubber, wood, and platinum the many thousands of shapes and forms that make up the Phantom.

The techniques vary. Parts are shaped, wound, etched, hammered, sawed, drilled, punched,

stretched, soldered, welded, riveted, glued and sealed. Technicians with years of experience read the blueprints, diagrams, designs and drawings and turn to presses that push with a force of 10,000 tons; chemical baths that etch away unwanted weight; automatic drills, mills, lathes, punches and profilers by the hundreds; welders, riveters, bonding machines and furnaces to shape the raw materials into the needed parts.

Systems, components, parts and raw materials flow from the thousands of suppliers throughout America. Canopies, landing gear, communication systems, radomes, tires, generators, engines, radar arrive by train and plane and truck.

All flow toward the final assembly area where the Phantom takes shape, moving along lines populated with seasoned assembly crews under whose hands each part, each component, reaches its time and place and is guided into position. The jacks fall away and the finished Phantom rolls to the paint shop and out the door.

Time-qualified flight test crews run final checks and bring the Phantom to life. Engineering test pilots advance the throttles and the Phantom is airborne, America's fastest, most versatile, most powerful fighter, ready to serve the air arms of the United States.



For booklet describing record flights of the Phantom, write: McDonnell, Dept. 08, Box 516, St. Louis 66, Missouri

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